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Planning of Research and Development

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BATTELLE TECHNICAL REVIEW

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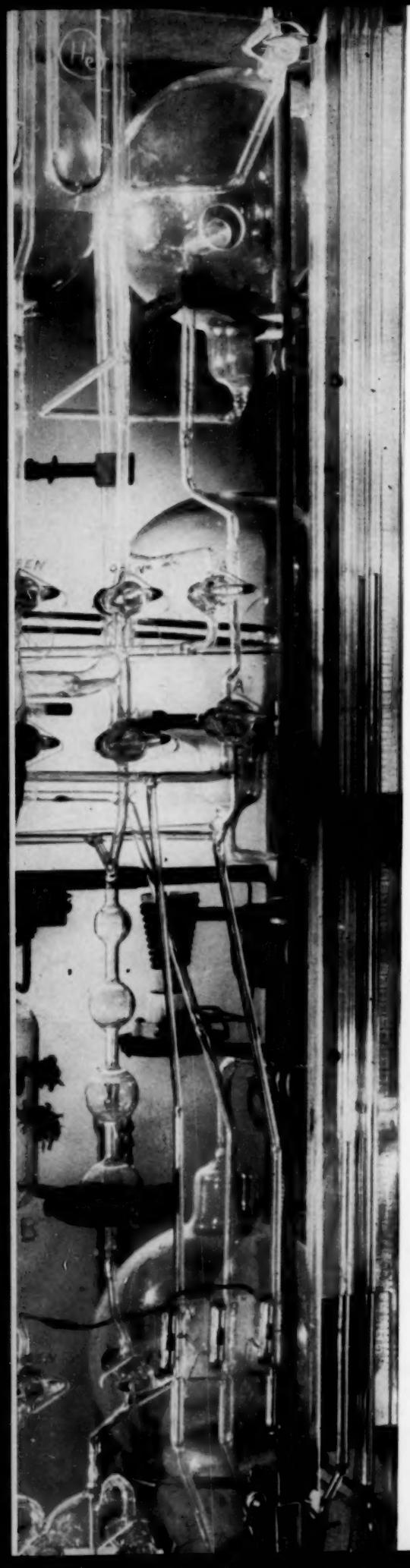

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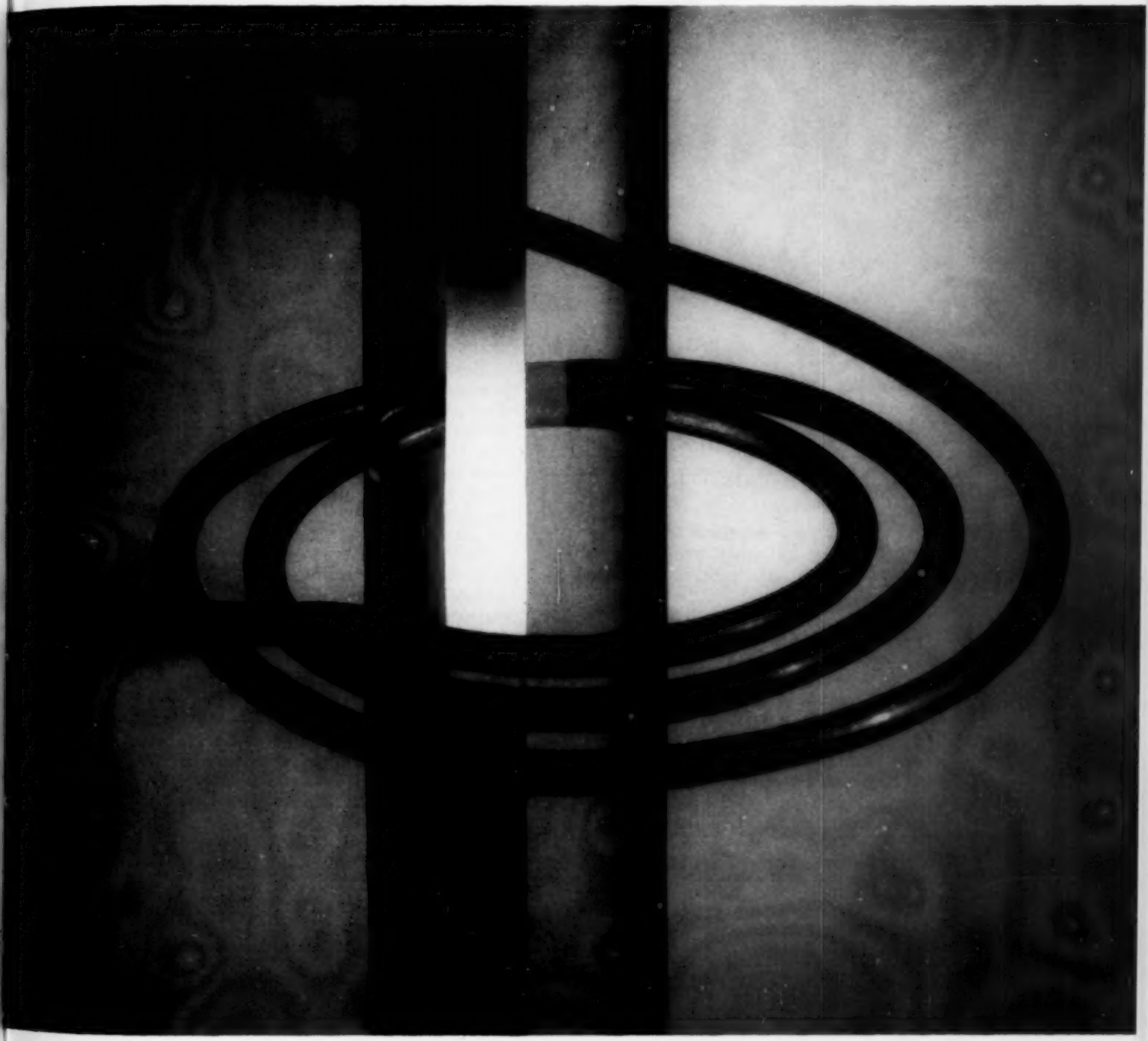
Abstracts of articles and papers in a wide variety of technological fields from more than 1350 journals published throughout the world. Abstract selection largely reflects the primary areas of Battelle research.

The quartz-enclosed ingot with its white hot zone demonstrates an effective technique being used at Battelle for purifying metals, semiconductors, and other intermetallic compounds. The technique is particularly useful for materials that, when molten, would be contaminated by contact with the containers required in horizontal zone-refining methods. The ingot may be moved slowly up or down the tube in an inert gas or evacuated atmosphere. As the molten zone moves, impurities are swept along with the zone to the end of the ingot. The molten material is kept from breaking away from the solid sections of the ingot by surface tension.



FLOATING ZONE PURIFICATION

VIGNETTE

CHEMICAL ENGINEER

ROBERT B. FILBERT, JR.

The thinking of scientists and engineers, like that of other people, often tends to fall into patterns induced by their work. And typically, the patterns are difficult to break when technologists work in their accustomed fields. But thinking that is patterned for one field may be entirely novel when applied to a different field. Thus, the technical man who has worked in one field often sees other problems with fresh eyes, and can attack them by atypical methods. In the view of Robert B. Filbert, Jr., this is one important reason for the effectiveness of team research. Several technologists, with their varying patterns of thinking, can approach a problem from diversified, often unorthodox, points of view. At the same time, the investigation can utilize people specially trained for research on the problem being considered.

Believing in the efficacy of such an approach, Bob has been willing to tackle a variety of problems. In his work, he has utilized the cooperation of technologists of varied backgrounds. His research experience includes investigations on problems related to process development for the heavy chemicals industry including agricultural chemicals, pulp and paper, pharmaceuticals, and specialties; the physical chemistry of high-temperature systems, including development of fuels for homogeneous reactors; and the application of nuclear energy to chemical processes. He has participated in studies on the recovery and refining of such metals as thorium, uranium, manganese, nickel, and cobalt, and has investigated liquid rocket-propellant problems. Important in many of these studies have been the evaluation and selection of, and the development of designs and cost estimates for, new processes.

Before joining Battelle in 1947, Bob was associated with the Hercules Powder Company as a design engineer. Earlier, he had served as an ordnance officer with the U. S. Navy. His technical training was gained in studies at Pennsylvania State University leading to a B.S. degree in chemical engineering and an M.S. in organic chemistry.

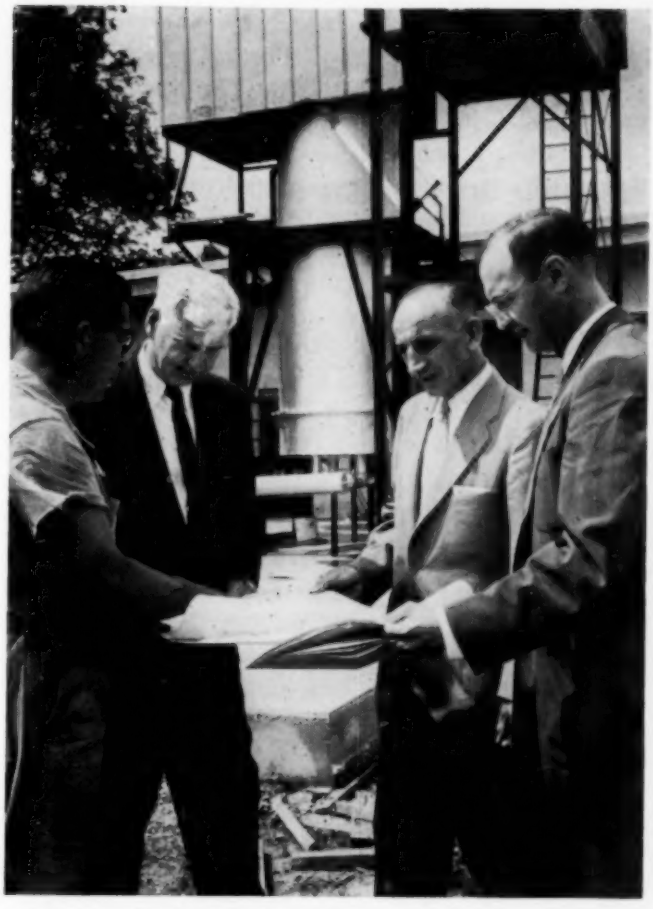
Bob is an active member of the American Chemical Society, the American Institute of Chemical Engineers, and of the American Ordnance Association. He has held all offices in the Central Ohio Section of the AIChE. Recently, because of his participation in technical and community affairs in Columbus, Bob was selected as "Technical Man of the Year" by the Columbus Technical Council.

Bob and his wife Joan share an active home life with their five-year-old son and four-year-old daughter. Yet they find time to enjoy their mutual interest in music. Bob, in addition, spends a large share of his spare time in community activities, leaving but little for less favored gardening.

Planning of Research and Development

The wise use of the increasing sums being expended for research and development calls for improved planning procedures. The author points out how cooperative planning, involving the entire organization, can assure more effective research and development.

by WILLIAM L. SWAGER



Cooperation by those guiding a company's production, marketing, and research activities is important. By consulting at each major decision point, they can help to assure a balanced research and development program.

IN THE POPULAR BOOK by Cameron Hawley, *Cash McCall*, the author, through his main character, Cash McCall, makes a rather shrewd observation regarding research and development. Cash is an amazing dealer in businesses, buying and selling at just the right times. Cash is talking with one of the bright young men in his employ:

> "Research is fashionable now—it's the thing to do—build a big beautiful laboratory and fill it up with Ph.D's. Theoretically, it *has* to pay off. In a lot of cases it hasn't—and there'll be more where it doesn't. I can buy a dozen companies right now that have poured too much down the research rathole. . . .
>
> "The trouble usually isn't in the lab, it's up on top. As I see it, that's the most common weakness in general management today. You can walk into company after company—surely you've seen it yourself?—and find good financial management, good production management, good sales management—everything under tight control until you hit research. Then it's a wing and a prayer."

In this fast-moving economy, it is entirely possible that many millions of dollars are going down the "rathole" to which Cash referred. It is a real responsibility for those of us who are concerned with the management of research and development to continually improve our planning and control so that our companies as well as the economy as a whole are getting the most return from scientific and engineering effort. This is particularly important in light of the present and probably future numerical limits to trained manpower.

Nearly everyone is familiar with the many definitions of basic fundamental and applied research and the confusion that arises from most of them. There is no need here for a lengthy discussion of definitions. For the purpose of management control, research and development can be divided into two categories—(1) intellect-oriented and (2) need-oriented.

Intellect-oriented research is that technical endeavor, usually considered basic or fundamental research, which is motivated by a man's curiosity. It is obvious that the control of this kind of research begins with and ends with selection of the man. Once he is selected and provided with equipment, assistants, and a research environment, there is no external control.

Need-oriented research and development, on the other hand, is that technical effort of interest to most of us, where our goals and motives are new products, new markets, lower costs, improved quality, and the like. Not many years ago, any sporadic improvements that may have resulted from research and development were considered business windfalls. Today, conditions are different. No one can afford to wait for windfalls. Most companies are working hard in the laboratories as well as in the factories to maintain and improve their competitive positions. It is necessary for them to do so. The pressure also forces them to weigh the relative importance of their needs for lower costs, improved quality, new products, and other advantages that research can give them. The planning and control of need-oriented research and development are inextricably entwined in the assessing of such needs and the economics of satisfying them.

Planning Research and Development

The basic foundation of research and development planning necessarily is an estimate of the company's future without or with varying degrees of technical effort. Like many difficult problems, this one is deceptively simple to state. Somehow the many factors influencing the future health of the company (such as the strength of the whole economy, shifts in markets and marketing, rising labor costs, and competitive pricing) must be assessed simultaneously with the impact of changing technology. Many businessmen who develop a feel for business situations and economic factors are puzzled when faced with changing technologies. Similarly, most men whose training and experience in the laboratory gives them the basic information and feeling for technical matters have no inclination for business and economics. The company research director has the responsibility of presenting to his management plans and programs that make sense from both points of view.

Starting with Business Considerations

Recognizing that any plan or program for research and development must have the approval of general management, there is only one place to start planning and that is with an evaluation of the business itself. How can research and development best help further the business aims of the company? Or put another way, what are the specific needs of the company that might be satisfied to some degree through research and development? Answers to these questions clearly indicate the yardsticks by which management will judge the reasonableness of a program and budget. How well the program is geared to answer the business needs of a company—not "interesting" technical details—governs its acceptance.

In many ways, the research director can be likened to the church rector who decided that it was useless to include in his sermons answers to questions that his parishioners had not asked themselves. Obviously, it behooves a technical director to formulate his plans so as to meet the business objectives management seeks. This is not to say that top management always seeks the right objectives from research. Nor does it deny the technical director the right to persuade and sell management on modifying or extending the business objectives related to the research program. It merely recognizes that a practical research plan must be geared to the needs of a business as management views them. In planning, it is important to identify explicitly the basic business needs of the company and to recognize their changing nature. Merely enumerating broad reasons why a research program is needed is not enough, and stating these needs in technical terms will only confuse management. What is needed is a careful analytical breakdown of the entire business to search out where improvements are most needed.

C. C. Furnas, in *Research in Industry,* suggests that the principal objectives of industrial research are:

1. To improve the quality of products.
2. To develop new materials, processes, or devices for existing or new markets.
3. To develop new uses for existing materials, processes, or devices.
4. To effect savings in cost.
5. To abate dangers or nuisances.
6. To prevent or cure troubles of production or use.
7. To assist in standardization.
8. To improve customer and public relations.

These are valid and are generally quoted as objec-

William Swager, since joining Battelle, has participated in and directed a variety of management and economic studies. These studies have been concerned with process evaluation, raw materials evaluation, cost estimation, market research, operations research, and management and planning of research and development. Through his association at Battelle with the problems of applied industrial research, he has come to recognize the importance of guiding research and development activities by continuing systematic evaluations of markets and other economic factors. The author guides management research studies at the Institute.

The whole company cooperates in developing sound research and development plans.

tives of research and development, but most of them are not stated in terms that imply the nature of the need. Unless business needs are emphasized, planning points only in the general direction of, rather than aims precisely at, the target. Here is an example of the difference: Most steel men agree that research effort should "improve the open-hearth furnace operations". Since there are many yardsticks by which improvements might be judged, this statement points only in the general direction. On the other hand, some steel men say that the aim of the research effort should be "to reduce the capital required for expanding the steelmaking capacity by increasing the effective capacity of present open-hearth furnaces". Numerous articles in the technical and trade journals recently have pointed to this dilemma of the steel industry. It is unable to finance from depreciation allowances and earnings from current operations the major expansion demanded by rising steel consumption. The careful statement of the research objective, incorporating the underlying business need, obviously is more easily understood and accepted by nontechnical members of management. Moreover, it is a more precise guide to research.

In an earlier article, the author suggested that all business needs or objectives can be reduced to two fundamentals:

1. To protect earnings of present facilities and products—defense of the present business.
2. To provide new opportunities for investment and earnings—an offensive strike for new business.

Defense Needs

Since some portion of a research budget must be allocated to defense or "maintenance of the line", it is well to analyze separately the needs of the business from this point of view. As N. A. Shepard wrote in "The Research Director's Job", published in *Research in Industry*:

> "The first responsibility of the research department is to guard the quality of the existing products of its firm and to protect the volume of business on these products. It is not enough to maintain existing quality and uniformity, through the efforts of the plant control department, which has the responsibility of maintaining the quality of the raw materials, uniformity of manufacturing conditions, and quality of the finished product. Research on improved methods of manufacture that will lower costs and/or raise the quality is essential if the company's position on the product is to be maintained and improved. A market always becomes more and more competitive the longer the product has been on it. This backlog of the business—the existing products—must be the first concern of the research director, and must not be relegated to second place, regardless of how enticing and lucrative new-product research may appear."

The following generalized statements of defensive needs are typical enough to apply in some measure to most companies:

- To maintain our share of the premium market, quality must be improved by reducing maximum limits of ..... by .....
- To maintain our margins in face of trends to lower prices, the basic processing costs must be cut by:
  1) Developing methods for using lower cost raw materials.
  2) Reducing processing waste.
  3) Reducing labor costs through mechanization and automation.
- To hedge against the anticipated shortage of ....., an alternative process should be developed.

Besides determining what is needed, some consideration should be given to timing. In an earlier article, the author used a concept of product life cycles to provide some insight on the question of timing. This approach is particularly useful in industries where products are subject to rather rapid technological obsolescence. Regardless of whether some relatively formal method of analysis such as this is used or whether general knowledge of the trade is weighed

intuitively, timing is important. As C. G. Harrel put it, "Choosing of projects must be as precisely timed as a well-planned military maneuver".

Offense Needs

Aggressive research and development, technology on the offense, is mainly concerned with development of new products and new processes. In this case, too, it is necessary to define clearly the business considerations underlying the need for new opportunities.

It has been observed that many companies are carried away by technically interesting developments, without asking first: How well does this fit our production experience? Can it be marketed through our present distribution channels? If not, what are the alternatives and risks? From the standpoint of research planning, these and other similar business considerations should be recognized and dealt with in the formulation of the objectives of the program. For example, some of the business reasons for developing new products or processes are:

- To counterbalance strong seasonal or other cyclical fluctuations in present product lines.
- To take advantage of a basic raw material position by vertical integration.
- To spread the cost of sales by developing a broader line.
- To exploit a strong distribution system.
- To exploit unique production know-how.

In order to make a sound appraisal, and subsequently a realistic plan, it is important to put the business needs — both offensive and defensive — in writing as agreed upon by top management. Such explicit statements of the business goals to be attained through research, and the consequences of not reaching them, are the essential yardsticks against which plans, projects, and programs must be judged.

Technical Objectives

Once the business needs of a company have been defined explicitly, it is necessary to translate them into related and logical technical objectives. This seemingly simple translation is critical and it has been observed that companies that do not make a conscious effort to do this job systematically sometimes have their research organizations working hard to find answers to the "wrong" questions.

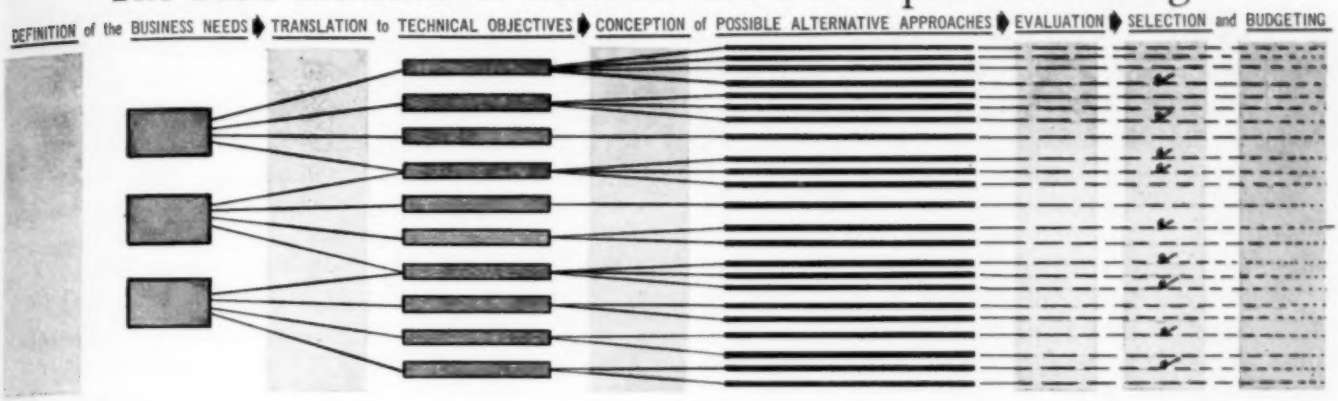
The following example from the steel industry illustrates what is meant by translating business needs into technical objectives. As was pointed out previously, one of the objectives of the managements of most steel companies today is to expand their steelmaking capacity with a minimum of capital outlay. What technical objectives, if reached, will contribute to the satisfaction of this important need? In a process as complex as steelmaking the answer is not at all obvious. There are many factors—technical and operating—affecting the times required for charging, refining, and pouring. It is difficult to define those technical objectives, which, if reached, would give production people the basic data to actually realize a reduction in average furnace cycle time. For example, one technical objective might be to improve the uniformity of charging materials. The analysis of hot metal from the blast furnace varies considerably and so does the amount of contaminants in scrap. The research job to determine what might be done to improve the uniformity of hot metal is a difficult, costly, and time-consuming one. It is also a difficult research task to find methods for improving the uniformity of the scrap charge. How much does nonuniformity of charge materials contribute to cycle time and other costs? How does this compare with the influence of other factors which may involve other possible technical objectives such as to (1) improve the precision and speed of analysis methods, and (2) determine the operating variables involved in the use of an oxygen lance. There are no categorical answers to these questions. Each company has unique factors to be considered. Today, most steel companies are developing a better understanding of all of these factors influencing cycle time by improving the reliability of process control data and by developing and using a more refined method of analysis. The term "operations diagnosis" has been introduced to describe this analytical approach to the defining of research objectives so necessary for sound planning.

Any company following this systematic procedure will have to consider a rather lengthy list of technical objectives of varying importance to its present and future profit position. Until adequate technical and economic information is assembled for indicating the probable relative costs, risks, and gains associated with each objective, there is no basis for selection.

Technical Alternatives

Ideas are the life-blood of a research organization and much has been written about creative thinking and idea evaluation. Ideas are not good or bad in themselves but only as they advance or retard the technical objectives of the company. To continue this methodical approach to research planning, it is necessary to define as many research approaches as possible to each of the stated objectives. An over-simplified example will illustrate the technique. Thus, the follow-

The Basic Elements of Research and Development Planning



ing alternatives are possible research approaches for reaching the technical objective of a lighter weight line of electric motors. Some possible alternatives include: (1) improvement through changes in configuration and design, (2) higher performance through new magnetic materials, and (3) safe operation at higher temperatures through improved insulation. Some degree of success might be achieved via any one of these routes. Which one or more of them should be pursued depends on the technical feasibility of each of the approaches as well as on further information, to be discussed later. In essence, this step lays out all of the conceivable research approaches contributing to technical objectives of the company. In any event, this step of the planning results in outlines of one or more of "possible projects" for each objective.

Comparison of Alternatives

Controlling research and development is the science and art of making use of new technical and economic data. To exert control, then, over a research program as new technical data are developed, as economic estimates are refined, and as economic conditions change, it is necessary to have a clear record of the basis on which the program was established. Having this information in an orderly system is somewhat like having a blaze on each tree along certain forest trails. Each blaze is information justifying the present paths. Research results may not confirm the "blazes". Economic conditions may change. If these blazes on present paths—information and estimates supporting the present program—are readily apparent, new information can be appraised quickly and control decisions made.

It is recognized that the evaluation of the many alternative projects that might be included in a research program is one of the most difficult tasks facing research and development management. Judgment must be made on the basis of incomplete technical and economic information. Because of the difficulties inherent in making these evaluations, there is great merit in systematizing the information which is available.

The basic elements involved in the evaluation of research and development projects are:

1. The probability of technical success. Obviously, there is no statistical method for estimating these probabilities, but some judgment has to be made of the relative technical feasibility. If technical men are unwilling to make their judgments in terms of a scale of numbers, one may resort to use of qualitative terms such as good, average, and poor.
2. Estimated costs for research, development, and engineering. On the basis of technical data available and experience, it is possible to estimate at least roughly, and certainly within limits, the funds required to "produce" the necessary technology.
3. The time required for research and development, engineering, construction, and, where applicable, commercial development. Although estimating the time required for each of these is exceedingly difficult, making initial estimates and revising them on the basis of new information at each program is important.
4. Estimated capital required. Some indication of the potential capital requirements that may be generated by the research program is needed. Here, again, precise answers cannot be expected, but order-of-magnitude estimates can provide useful guidance.
5. Estimated profit or other gain that may be realized, assuming the technical objective is reached. Basic to such estimates are the results of market analyses, projections of competitive actions, and cost analyses.

The soundness of the ultimate planning decisions

obviously depends upon the resources, knowledge, and experience of the men making the estimates, and upon the validity of the information that can be supplied to them from all parts of the company. It is possible just to tabulate all of the information available and to make decisions from this tabular form. However, since there are so many degrees of risk payoff, cost, etc., among all of the possible projects, it is difficult to see clearly the relative desirability of each, unless some additional analysis is performed.

There are a number of arbitrary rating systems that have been devised to systematize the evaluation of alternative projects using the information indicated above. For example, the method used by American Alcolac as reported in *Business Week*, March 31, 1956, involves this formula:

$$\frac{\text{Chances of Technical Success} + \text{Chances of Commercial Success} + \text{Annual Volume} + \text{Price-Cost} + \text{Life}}{\text{Total Costs}} = \text{Project Number}$$

In this case, an additional time factor is included, the average life of the product resulting from research and development. The project number is an arbitrary index that indicates the relative "value" to American Alcolac of one project compared to others.

There are a number of other arbitrary schemes. Any one of these schemes is useful in developing series of arbitrary ratings to indicate the relative value to a company of alternative research and development projects. Unfortunately, any such scheme has its built-in bias, and must be considered only a rough yardstick. Perhaps one of the most severe of the difficulties encountered in the use of one of these rating systems is that the ratings tend to be gospel. There is no substitute for judgment, and if a rating scheme is adopted, caution should be exercised to make sure that the rankings are used to aid judgment, not stifle it. In spite of all of these shortcomings, some system of this sort is quite desirable for it tends to concentrate the reasons for differing opinions on the underlying estimates, removing generalities from the argument.

Competition for the Budget

Unfortunately, the literature on research and development generally omits one very important matter that has to be considered after these basic business needs or goals have been clearly identified. Business or commercial methods of attaining such goals also must be considered. For example, the value of an expenditure for a research and development program aimed at reducing costs and improving quality will be judged by top management against the value of a similar expenditure for advertising to maintain a product at current prices. In much the same way, management will compare the merits of purchasing a going concern as an expenditure of research and development funds aimed at new product development. A well-conceived research and development plan, before presentation to managment, will have received some study regarding these possible business routes to desired goals.

With this suggested stepwise approach to planning, the basic information necessary to planning decisions is available, systematized, and tied to business considerations. The logic behind the over-all budget request need not be clouded with technical details; the suggested allocation between defense and offence can be rooted in the analysis of the needs of the business; the selection of projects and programs under each of these can be supported.

Whole Company Aids Planning

Successful research and development in the broadest sense is the responsibility of the whole organization. The research people alone cannot develop all of the information necessary for sound plans nor can they alone reap the benefits for the company from research well done.

The marketing point of view is important in guiding research and development decisions. It is necessary to recognize that the sales and marketing people can make important contributions to the thinking of a company not only in the area of new product development, but also on research that is geared to "maintenance of the line".

The manufacturing department also makes an important contribution to the over-all productivity of a research and development department. Accurate records on costs and good data on process control, when properly analyzed, help define research and development objectives. In addition, the ability of the manufacturing organization to visualize, evaluate, and put into practice new technology dictates how much and when gains can be realized from new technology.

The financial organization of a company also has an important contribution to make—to systematize the procedures and methods for economic evaluations. Accounting procedures and methods can either streamline or bog down the decision-making processes necessary for getting new technology into being.

Although the "success" of the research and development department is the responsibility of the vice president or director of research, the whole organization must contribute in a coordinated way to the sound formulation of research and development plans. If this spirit of cooperation can be developed in the formulation of plans, a relatively tight screen will have been placed over the "rathole" to which Cash referred.

PROFITING from RADIOISOTOPES

The application of radioisotopes to technical and industrial problems is still in its infancy, and even greater benefits may be expected as new techniques for their use are developed. These materials may well prove to be one of atomic energy's greatest benefits to us as they aid in solving many long-standing industrial problems.

by MEYER POBERESKIN

IN THIS "DAWN OF THE ATOMIC AGE" in which we are living, the peaceful uses of atomic energy may be considered to be of three general types. These are: (1) The production of power from nuclear fission, (2) The application of massive radiation fields from fission products to such uses as sterilization and activation of chemical reactions, and (3) The use of radioisotopes and their radiations as tracers and devices for the measurement of properties of materials. The benefits which will accrue to mankind in the near future by virtue of the development of all the above aspects of atomic energy have been highly publicized. In this article, however, the benefits which are available today to the user of radioisotopes and their radiations will be emphasized.

The radioisotope tracer technique has been called "more important than the microscope" for solving research problems. Just as the discovery of the microscope stimulated many new fields of research in biology, the tracer technique is expected to stimulate developments in science and industry generally. It has also been said that applications of radioisotopes and their radiations will have a greater effect on our civilization, economically and ecologically, than the development of power from nuclear fission.

Let us ponder this comparison a little further. Considerable expenditures for development will be required in the near future before competitive central station electrical power from atomic energy becomes available. Moreover, this development must take place in competition with fossil-fuel power stations, and must face possible future competition from the development of solar power and nuclear fusion power. Capital investment in the development of atomic power, therefore, must be viewed as a long-term matter with some element of risk. On the other hand, relatively little investment is necessary for operation with tracers and many industrial applications have been made which resulted in immediate savings to users of radioisotopes. In addition, the radioactive tracer technique is a unique one for which there is generally no suitable substitute.

A 900-page report on peaceful uses of atomic energy, by the McKinney panel in January, 1956, reviewed the position of industry in the development of radioisotope applications. Although this report was concerned primarily with the future impact of atomic energy, it was estimated that industry saved 180 million dollars annually through the use of radioisotopes. In early 1957, the annual savings was estimated at about $390 million, broken down as follows:

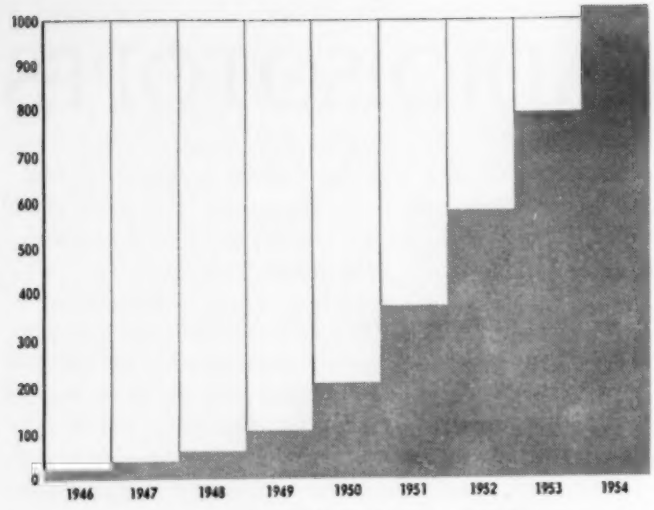
111 million with radioisotope thickness gages.
42 million by radiographic testing.
178 million in petroleum production.
60 million in miscellaneous uses.

The predicted annual savings to industry through use of radioisotopes is expected to exceed $1 billion by 1960.

BASIC PRINCIPLES

It is desirable, before proceeding to a description of examples of the use of radioisotopes, to consider some of the fundamental principles on which radioisotope applications are based. First, it should be pointed out that the use of radioisotopes does not stem from the discovery of nuclear fission, but, rather, nuclear fission resulted from radioisotope studies. The studies originated at the end of the 19th century with the discovery of the natural radioisotopes such as radium. This discovery stimulated the subsequent work on the nature of the nucleus which let ultimately to the discovery of nuclear fission.

In a sense, the discovery and utilization of nuclear fission may be considered a revolutionary development of the study of the nucleus. In the same sense, the



The number of industrial users of radioisotopes has climbed steeply since 1946. From only 12 users in that year, the total increased to 1020 in 1954.

development of the use of radioisotopes may be considered evolutionary. Thus, the wide-spread applications of radioisotopes today are directly derived from, and owe much to the studies of, the early workers with natural radioisotopes. In the first third of our century, these scientists carried out fundamental studies in such fields as self-diffusion, crystal growth, solubility, tracer reactions, and determination of the age of the earth. Many of these investigations still stand as models in their field, and they provide the fundamental basis for continuing studies to this date. Soon after natural radioisotopes were discovered and some of their properties understood, many applications of industrial importance were made. We were all familiar, long before the discovery of fission, with the use of radioisotopes in producing self-luminescent phosphors, static electricity eliminators, and radiation therapy sources. The application of radioisotopes in research and industry was limited, however, because of the small number of natural radioisotopes and their limited supply. With the discovery of nuclear fission and the nuclear chain reaction, however, a new dimension was added to the use of radioisotopes. Now, we are able to produce in nuclear reactors large quantities of radioisotopes of almost all the elements in the periodic table, including some which had never been found in nature.

What makes radioisotopes such powerful tools? First, from the viewpoint of their use as tracers, the main factor is that radioisotopes exhibit the chemical and physical properties of the elemental species to which they belong. They may be identified, however, in the presence of large amounts of the nonradioactive isotope by virtue of the radiations which they emit. Moreover, each radioisotope may be specifically identified by virtue of the specific type of radiation which it emits, by the energy of this radiation and by its half life (the period during which the radiation intensity is reduced to half its value). All these properties relating to energy may be readily and precisely measured.

In the second place, on the basis of fundamental properties described briefly above, radioisotopes may be used in tracer applications. The most rewarding industrial applications of radioisotopes to date, however, are based upon the effects matter has on radiation; namely, matter absorbs, scatters, and moderates radiation in a manner which depends on the nature of the material and the radiation. These effects have become the basis for a large number of devices for measuring properties of and controlling the production of a wide variety of materials.

A third basis for radioisotope utilization, the manner in which radiation affects matter, will not be discussed here. The situation with respect to the development of such uses of radiation as the activation of chemical reactions, though of great potential industrial interest, falls in much the same category as the development of nuclear power. Here again, considerable development is required before applications of this nature become of industrial importance. An element of competition enters, too, not only in the shape of other forms of energy for accomplishing the same results, but also in the necessity of competing with machine-made radiations.

Radioisotope Applications

The industrial applications of radioisotopes, based on the effects of matter on radiation and on utilization as tracers, are very broad in scope. There are uses in

The author's efforts have been primarily devoted to nuclear, and especially radioisotope, research. At Battelle, he has explored the use of radioisotopes as tracers in the formation of point-contact transistors, in machine tool and other wear problems, and in the analysis of lubricating oil consumption. In other studies, he utilized radioisotopes to determine the diffusion of water through protective coatings and to discover the mechanisms by which various chemical processes take place. Earlier, Pobereskin investigated the recovery of fissionable materials and transformation products from irradiated fuel materials and the disposal of radioactive wastes. He is a member of the Atomic Industrial Forum's Subcommittee for Fuel Reprocessing.

practically every field of industry, science, and engineering. It is the purpose here to discuss some of the applications of this type in a general way, with more attention to the manner in which the petroleum industry has exploited radioisotopes in almost all facets of its operation. Here is a model for other industries to emulate.

Process Control

The absorption of radiation by a material is dependent upon the characteristics of the material, its density, and the amount in the path of the radiation. This makes radiation from radioisotopes suitable for use in instruments measuring such properties as thickness, density, and composition. For example, the following applications are presently being used in industry:

Thickness Gages

Devices of this type are being used to control the thickness of sheet materials of all types from steel to paper. In this application a beam of radiation, normally beta particles, is passed through the sheet from one side and its intensity measured by a detector on the other side. Radiation source and detector scan, in unison, the width of the sheet as it rolls through the mill, while a signal indicating sheet thickness is produced continuously. This signal may be utilized for either manual or automatic control of the rolling mill.

In many operations it is desired to measure the thickness of a material coated on some base material. In this case, one utilizes the backscatter principle; that is, that beta particles are scattered from materials in a manner dependent upon the atomic number of the material. By directing a beam of beta particles upon the coated material and measuring the reflected beam on the same side of the material, a measure of the thickness of the coating is obtained. This may be accomplished also on a production-line basis and utilized to control the thickness of the coating.

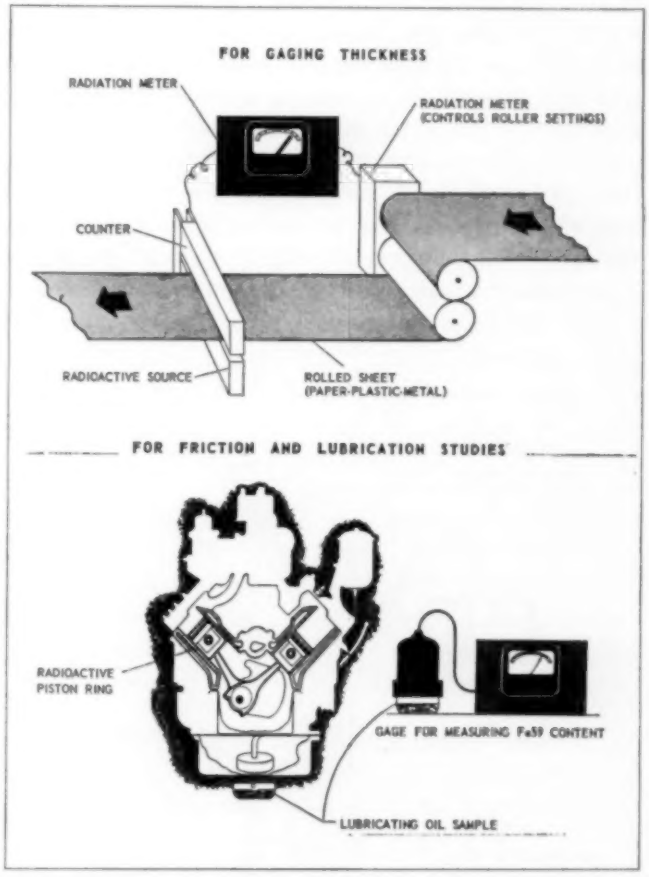
The beta gage is used to measure the moving web of a material as it is produced. It does not contact the material, and it measures continuously and automatically. Beta gages have high sensitivity, of the order of ten micro-inches, and a good precision, about one to three per cent.

Density Gages

If the thickness of the material is known, as for instance, in the flow of a fluid through a pipe, the density of the material may be measured. In this case, the radiation source and detector remain stationary while the material whose density is being measured flows between them. Since the attenuation of the radiation beam is a function of density, the detector signal may again be used to maintain density at some desired value. The cigarette firmness gage with which we are probably all familiar by virtue of the extensive advertising given it, is essentially an application of the density-gage principle. In this case, the radiation signal is transmitted through the cigarette and a standard simultaneously. If the density of the cigarette varies beyond given limits from the standard, it is automatically rejected.

Liquid Level Gages

Many types of liquid level gages are available. These are most useful in the case of liquids which are highly corrosive and which must be contained in metal or other opaque materials. Radiation source and detector may both be situated outside the tank and still measure the liquid level with precision. Such devices are par-



Radioisotopes are important as radioactive sources for use in gaging the thickness of materials (top). The advantages in using radioisotopes include these points: radiation sources may be selected to suit the material to be gaged; no marking material is required; since there need be no contact with the material, there is no tearing or other destructions possible; and radioactive gaging is rapid and reliable. (Bottom) Radioactive iron makes rapid, simple, and economic studies of friction and lubrication possible. As little as 1/100,000 of an ounce of transferred metal can be measured. Moreover, oil can be sampled while the motor is operating.

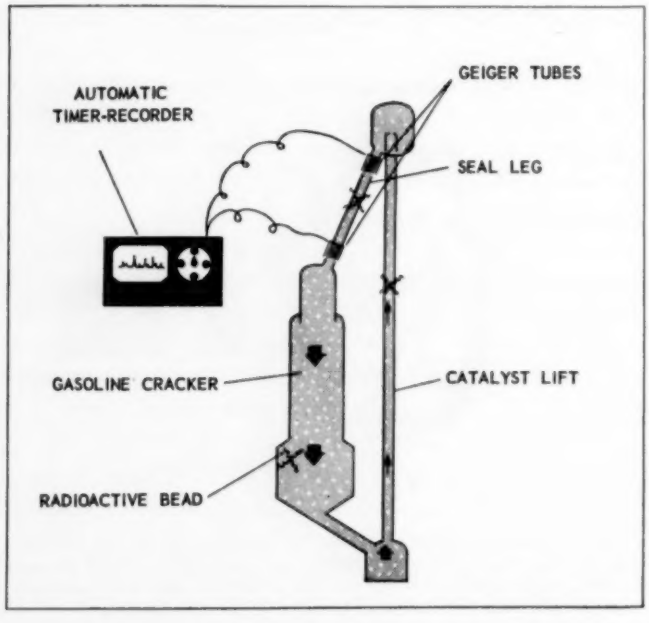
ticularly suited for control of liquid level at some preset value.

Over 300 companies of all types now use radioisotope thickness gages, with yearly savings averaging about two per cent of the product value. In particular, these devices have proved most valuable during production startup, when savings have reached 10 to 20 per cent of the product value, indeed, the cost of the control instrument has frequently been repaid during this startup period.

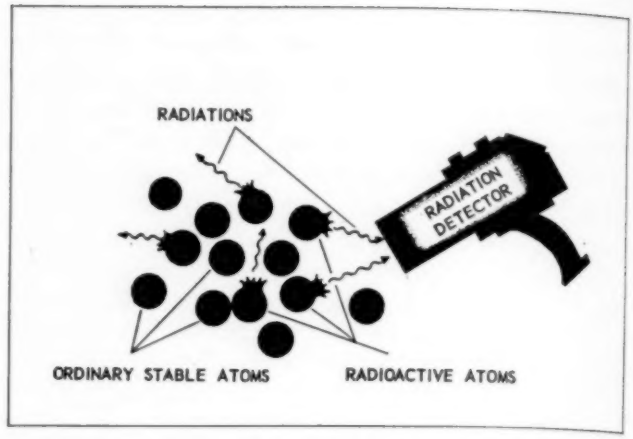
Gamma Ray Radiography

Although the X-ray machine has by no means been displaced, a new dimension has most certainly been added to radiography through the use of gamma ray radiation sources. Such sources are available in a wide range of energy and, of most importance, in energies ranging above one mev, which are available only in very expensive X-ray machines. In addition to the ready availability of high-energy sources, some other advantages are: the source is relatively portable; it may be used in inaccessible places; it requires no power; and, except for occasional replenishing of the radioisotope, no maintenance is required.

Gamma ray sources are particularly applicable to the radiography of tanks in the field. In this application, the source may be set up overnight to provide a radiograph of the previous day's welding operations. In one exposure, an arc of 360 degrees may be covered.



The use of radioactive beads for measuring catalyst flow rates assures effective and economical operation of equipment. The measurement of the flow rate is accomplished by determining the amount of time required for successive beads to pass the counters. The method does not interfere with production, gives immediate indication of improper operation, and makes possible the automatic adjustment of the flow rate.



Since radioactive atoms behave like stable atoms, but can be traced by their radiation, radioactive atoms are ideal for use in studies of chemical mechanisms and processes.

It has been estimated that using radioisotopes for inspecting Horton spheres saves $6000 per 50-foot sphere. Gamma radiography is also particularly suitable for the inspection of pipeline welds. The radiation source may be drawn through the pipeline and each joint inspected in one exposure as soon as it is welded.

Tracer Applications

Radioisotopes have been used as tracers in almost all fields of technology and science. We have already mentioned some of the factors which make radioisotopes so suitable for tracers. In addition to those factors mentioned previously, the following are conditions under which radioisotopic tracing may be advantageous:

1. The quantity of material to be traced is very small.
2. The material being traced is difficult to separate from other substances with which it is associated.
3. The material is to be located with respect to the position of others in a sample.
4. A sample is to be analyzed nondestructively, or in place.
5. An analysis is to be made rapidly before some further change occurs.
6. A material is to be traced in the presence of itself.

Some examples of the application of radioisotope tracers are cited below:

Analysis

Chemical and spectrographic methods of analysis are generally accurate and sensitive to the parts-per-million range. Using radioisotopes in the techniques of isotopic dilution analysis, radiochemical analysis, and activation analysis, we may extend the range of ac-

curate analysis to parts-per-billion sensitivity and in many instances parts per trillion. Even in the range of ordinary chemical analysis, radioisotopes may frequently be used because they simplify the analytical techniques, and enable one to accomplish a given analysis cheaper and quicker.

Research and Development

Radioisotopes have been so widely used in research and development that it is difficult to select typical applications as examples. The basic principles for the selection of radioisotope tracers for any particular study generally depend not only on the properties of radioisotopes as tracers but also on the particular circumstances of the system under study. For example, radioisotopes were found to be ideal for the study of vapor deposition of metals. In this application, the extreme sensitivity of radioisotope detection was of prime importance. Under ideal circumstances, it should even be possible to detect monomoleculer layers. The measurement of the vapor pressure of metals under conditions of extremely low vapor pressure may also be made with high sensitivity of radioisotope tracer techniques.

Studies of solid-state diffusion, particularly self-diffusion, have been stimulated through the use of radioisotopes as tracers. In this case, the ability to detect the radioactive species of an element distributed in the nonradioactive element is of prime importance. The factors which affect the physical properties of the element may thus be studied with extreme sensitivity. The above holds true generally in the study of the distribution of an element in trace amounts in an alloy or other system. The location of the trace element in the matrix may be determined with high resolution and related to the structure. The effects on the properties of the system as a function of the location of the tracer may be studied in a relatively simple fashion.

Radioisotopes have been used quite extensively in studies of wear, in particular with relation to the wear of cutting tools and the wear in engines. These studies are based on the activation of the part whose wear is to be studied. Operation of the machine or engine may then be carried out under usual operating conditions. The worn material may be detected and measured in some part of the system, for instance in the lubricating oil of an engine, and the wear rate determined as a function of operating conditions. A large oil company recently stated that it obtained more information concerning engine wear in four years, at the expenditure of $35,000, than it could have obtained without radioactive tracers by spending $1 million over 60 years. This statement suggests some of the technical and economic advantages to be gained by the utilization of radioisotopes in research.

Petroleum Industry Applications

Perhaps the most widespread application of radioisotopes is to be found in the petroleum industry. Radioisotopes have been used in almost all phases of this industry's operations and new applications are still being diligently developed. Radioisotopes and their radiations play a part in the exploration of new oil fields. Extensive aerial radiation surveys are used to help provide an indication of suitable areas for drilling. In this instance, the reduction in the natural radiation background of the earth over an oil deposit betrays the location of the oil. In the drilling operation, a survey of the bore hole may be made with a neutron logging device. This instrument is used to determine the composition of different strata in the well by virtue of their propensity to moderate the neutrons. Oil-bearing strata may be located because they are relatively very efficient moderators. In the production of oil, the process of acidizing an oil well is frequently used to increase its output. This process is now controlled by the use of radioactive tracers and radiation detectors which enable a precise control of the acidizing process and insure greater oil production.

Many uses have been found for radioactive tracers in the refinery. They have been used extensively for study of many phases of refinery operation, and also for process control in the refinery. Thus, for instance, radioactive tracers were used to study the mechanism by which catalysts affect gasoline production. Later, some of the techniques developed in these studies were applied to control catalyst flow rates during gasoline production. Radioactive tracers are used in the transmission of different oil products in pipelines. Here the tracer is introduced to mark the interface between two different oil products. At the receiving end, the diversion of the second product to its own storage tank is accomplished with the least loss of either of the products. It has been estimated that with antimony-124 marking the liquid interface in oil pipelines, a $50 saving is chalked up every time a diversion valve is thrown.

In the brief space available, there has been an attempt to present some background for, and examples of, the manner in which radioisotopes are used in industry. Though the applications presented have been quite profitable to their users, radioisotope applications in general must still be considered as in their infancy. The great accomplishments and benefits are still in the future, and are awaiting only the ingenuity and imagination of those who master the technique of radioisotope application. Many long-standing industrial problems will undoubtedly be solved with this powerful tool, leading to new products and less costly products and processes.

NOTES from BATTELLE

MOLYBDENUM WELDING

Molybdenum's usefulness as a high-temperature structural material would be greatly extended if the bend ductility of weldments could be increased between room temperature and about 400 F. Investigation has shown that fairly ductile welds in commercial molybdenum can be made in high-purity dry box atmospheres. However, because it is necessary to weld many pieces in air, effective methods for shielding during welding are desirable.

Battelle welding technologists N. E. Weare, R. E. Monroe, and D. C. Martin participated in a preliminary study of weldments in a dry box to determine the effects of sheet-cleaning procedures, recrystallization of sheet prior to welding, and atmosphere purity on the bend ductility of molybdenum weldments. They investigated supplementary shielding methods for welding outside the dry box. Then they utilized data from the studies for consistency runs to determine whether weldments with consistent ductility could be made in different heats of arc-cast carbon-deoxidized molybdenum. Subsequent bend tests were made at room temperature and at 75 C.

The investigations brought out the following:

- None of the cleaning procedures was outstanding so far as weldment ductility was concerned.
- Recrystallization of fibered sheet had no effect on weldment ductility.
- Welds made in a low-purity atmosphere were slightly less ductile than those made in a high-purity atmosphere in the dry box.
- Of three methods studied for shielding in air, an inert-gas-shielding cup and a leading-trailing shield unit were best and gave about the same ductility.
- While there were significant differences in ductility of welds made on different heats of molybdenum in the dry box, the differences were not so great as in the case of weldments made with shielding in air. Moreover, the ductility of the latter were also lower.

The technologists concluded that, although the research throws some light on the factors which affect ductility in the temperature ranges to 400 F, much more work is required to improve shielding during welding molybdenum outside the dry box.

TOWARD TITANIUM CASTING

While the industry for production of wrought titanium products is now fairly well established, a titanium casting industry is not yet in existence. The limited development of the latter may be attributed largely to the relatively small amount of research effort directed to the solution of the problems involved. As yet, a commercial process has not been developed for producing titanium castings that meet close specifications as to shape, dimensional tolerances, finish, high strength with adequate ductility, and freedom from deleterious contamination. However, research has been extensive enough to indicate that there is a sound metallurgical basis for establishing a titanium casting industry, according to Battelle metallurgists G. H. Schippereit, R. M. Lang, and J. G. Kura.

Limited industrial and governmental research has been carried on in various laboratories relating to:

1. Melting furnaces to produce a large uncontaminated pool of metal to be poured for castings.
2. Mold materials that will produce uncontaminated castings with a smooth finish.
3. Alloys with good castability and improved mechanical properties.

Some success has been achieved in melting in consumable-electrode, skull-melting furnaces equipped with water-cooled copper crucibles. Very rapid melting is accomplished by use of high-current density and reduced pressure. With this technique, a large molten pool of uncontaminated titanium is obtained for pouring.

Fixed-electrode, skull-melting furnaces have also been used, but they are less satisfactory because of the difficulty of obtaining adequate superheat in the melts. Experiments with induction furnaces employing a high-intensity electrical field and a graphite crucible indicate that carbon contamination may be limited to a content ranging from 0.066 to 0.15 per cent. Metal with the carbon content at the high end of the range could be used where ductility is not of major importance.

Currently, the best molds for producing sound, smooth castings with the least surface contamination appear to be those machined from solid blocks of graphite. These have certain disadvantages, however; they are expensive, apt to have a short life (about 50 castings), likely to produce rippled finish on castings, and offer only a limited variety of mold cavities.

Expendable molds of refractory oxides or graphite powder have been used with some success for small castings. Shell, rammed graphite, and investment molds have provided sound castings with good surface finish. However, such castings have a greater depth of contamination than those made in machined graphite molds.

Limited study has shown that titanium and some titanium alloys cast in machined graphite molds have strengths approaching those of annealed wrought titanium of similar composition, but with somewhat lower ductility. Moreover, it appears that no serious problems relating to alloy segregation or unsoundness from solidification shrinkage are to be expected.

Present estimates indicate that if a titanium casting industry is established by 1960, there may be a market for as much as 3500 tons of such castings. The potential market is in the aircraft, missile, and chemical process industry, with marine and ordnance applications a good source of demand.

* DE-ICING COATING

One product of recent Air Force research may some day help to keep auto windshields free of hazardous ice and fog. The de-icing method involves a transparent windshield coating carrying an electric current that heats the underlying glass.

Following a research program outlined by the Materials Laboratory of the Air Research and Development Command's Wright Air Development Center, technologists at Battelle have developed an improved de-icing coating for airplane windshields. Such conducting coatings are not unknown, but, previously, transparency equal to that of the Battelle coating could not be achieved at temperatures below about 800 F. Battelle technologists, however, have developed a coating technique that employs the relatively low temperatures between 250 and 400 F. At these temperatures, which do not cause distortion of the glass, the process produced highly transparent coatings.

Starting with the soft metal, indium, Battelle scientists produce a coating of indium oxide that forms an excellent, transparent film on the glass. The coated glass transmits about 85 per cent of the light that strikes the glass. Also, the film can be heated electrically to a temperature high enough to boil water. The film, though microscopically thin, is mechanically durable.

The Air Force points out that in addition to use on aircraft and possibly automobile windshields for de-icing and de-fogging, the indium oxide films may possibly be applied to certain plastics and other materials that melt at relatively low temperatures.

* SCRAP AVAILABILITY REPORT

With rising exports of iron and steel scrap, increasing attention has been focused on the analysis of domestic supplies of, and demand for, ferrous scrap. Previous estimates of future domestic scrap supplies in relation to probable demand were contradictory, suggesting that a better factual basis for estimates was needed. Therefore the Business and Defense Services Administration of the U. S. Department of Commerce, in cooperation with a committee representing both the iron and steel and the scrap industries, studied the strengths and weaknesses of previous surveys. Out of the study was developed a survey and analysis procedure which was recommended for subsequent use.

In 1956, Battelle was asked to carry on a new survey, which had been called for by Congress. The newly developed procedure was employed by the Battelle investigators.

In summarizing some of their data, the Battelle investigators report that the gross input of iron and steel into the country's economy from 1881 to 1955 was about 2.91 billion net tons. Of the total, approximately 930 million tons have returned to the industry as scrap. About 540 million tons were lost to the economy through exports, corrosion, war losses, and uses from which the metal cannot be recovered. The total iron and steel remaining in the over-all inventory is about 1.5 billion tons. Various appendixes to the report include tables and explanatory material showing how various totals were arrived at. The types of data analyzed included estimates of the total inventory of potentially recoverable iron and steel, estimates of the net inventory of iron and steel in use and the reservoir of absolute metal, and the influence of technology upon the scrap situation.

The complete final report was published as Exhibit I in *Report On Iron and Steel Scrap by the Department of Commerce, Pursuant to Public Law 631, 84th Congress.* The *Report* is published by the U. S. Government Printing Office.

FOREST FIRE PROTECTION

The United States Department of Agriculture has announced that a study will be made of ways the Federal Government, state governments, and private landowners can share the cost of protecting non-Federal lands from forest fires. The contract for the study was signed by Battelle with the Department's Forest Service.

The study, which is expected to take a year to complete, will seek to determine the dollar value of the resources of non-Federal forest and watershed lands which should be protected from fire. It will include the degree of forest fire protection needed for these lands, the fire protection now given, and the extent to which the public agencies and private owners should share in the cost of this protection.

In arriving at recommendations the researchers will consider such things as the number of wood-using industries dependent on the forest crop, the number of people employed in these industries, the volume and value of water from these lands, together with expenditures already made for water control.

TRACERS IN WEAR STUDY

Grinding for size reduction is an important industrial operation that affects the economics of many processes and products. Wear of the grinding media constitutes the largest part of the cost. The use of grinding balls best suited for a process provides the most effective method for increasing its efficiency and decreasing its cost. The grinding of cement presents especially complex problems, and technologists have found that the best way to evaluate grinding balls proposed for use in the process is to test them under field conditions.

However, field testing of sample lots of balls has been impracticable because of the difficulty of identifying them and recovering them from the mill charge after conclusion of the grinding. Physical markings, used hitherto, are often masked by the product coated on the balls or by the wearing away of the notches, holes, or other marks put in the balls.

A feasible technique for positive identification of test balls has been reported by M. Pobereskin, N. M. Ewbank, Jr., G. D. Calkins, A. Wesner, and J. E. Campbell, all of Battelle. The proposed technique involves the thermal-neutron irradiation activation of test grinding balls. Identification of specific groups of balls is then possible by activating each group to a different level of specific radioactivity.

Before irradiation, the composition of the steels must be ascertained so that the radioactive nuclides that will be formed can be known. The initial radioactivity level, in the light of these facts, must be carefully planned, so that there is no radiation hazard, yet so that adequate radioactivity will remain after the run to identify the balls. The intensity of radiation that can be detected by a Geiger counter upon completion of the test forms the basis for establishing the minimum activation level.

In an investigation carried on for the Coates Steel Products Company, Battelle technologists succeeded in recovering 98 per cent of the specimen balls. Their study indicated that 100 per cent recovery should be achieved if radioactivity level of the balls were increased from three times the background level to ten times. Also separation of the balls into groups after a test run, can be accomplished with greater facility if greater differences in activation between various lots of balls is established. Fifty to 100 per cent differences in radiation levels seem desirable.

PROGRAM IN SPAIN

In Spain, as in other parts of the world, the interest in nonferrous metallurgy has been growing rapidly. The desire for an active Spanish research center in this field, led, in 1955, to the establishment of a training program in Madrid for a selected group of young metallurgists.

Battelle was selected to conduct a one-year training program, which has just been concluded. Specialists in metallurgy from the Institute' laboratoriess in Columbus and Geneva aided in the program through lectures and consultations.

Battelle's Bruce Gonser and Webster Hodge report that special attention was given to research techniques relating to such fields as: the unusual metals, metals and alloys for high-temperature use, the light metals, powder metallurgy, and metallurgy in the utilization of atomic energy. The young technologists were also given training in the planning of investigations, the organization of services, and in meeting the problems that might arise in the investigations they may be called upon to conduct.

Many of the activities were carried on in the laboratories and library of the Instituto del Hierro y del Acero and some members of that Institute's staff also presented lectures. The close cooperation of Professor Manuel Lora Tamayo greatly contributed to the program's successs. He is secretary of Patronato "Juan de la Cierva", the Spanish research council which sponsored the training program.

Writings by STAFF Members

Management, Economics, and Technology for the Atomic Industry. v. II. "Economics and Technology". Atomic Industrial Forum, Inc., contains the following articles by staff members:

The Battelle Research Reactor. A Case History. H. R. Nelson. pp. 203-212.

Describes the Institute's pool reactor and its associated physical plant, including costs and economics of the installation, operating schedule, and current applications.

Considerations in the Selection of a Nuclear Fuel. Frank A. Rough and Henry A. Saller. pp. 135-138.

Reviews problems associated with solid fuels and indicates regions where further development is needed or expected. Since less is known about operation of fuels at the high temperatures which characterize recent reactor designs, the performance of both the core materials and of the composite of core and clad must be proven. Further development of the refractory metals for these cladding applications may also be profitable.

Tobacco Aging, Enzymes of Bright and Burley Tobaccos. Robert E. Barrett. *Journal of Agricultural and Food Chemistry,* March 1957, pp. 220-224.

Using manometric, colorimetric, titrimetric, and viscometric techniques, marked differences in enzyme activity were shown between unaged flue-cured tobacco (bright) and unaged air-cured tobacco (burley). Aging of bright tobacco involves primarily chemical effects and aging of burley tobacco possibly involves both chemical effects and enzymes.

Chronology of Cobalt. F. R. Morral. *Wire and Wire Products,* March 1957, p. 300 + 5 pages.

Outstanding events relating to the production and use of cobalt are listed chronologically, from 2680 B.C. to the present time.

Organic Coatings in Metal Finishing. L. J. Nowacki. *Plating,* March 1957, pp. 269-273.

Advances in the organic coatings industry, types of coatings available, and the mechanics of film formation are reviewed.

Ladle Brick and Casting Pit Material. **Pfannensteine und Giessgrubenmaterial.** Rudolf Rasch. *Sprechsaal,* v. 90, January 1957, pp. 43-47.

Surveys composition, preparation, properties, and applications of these refractories, and describes effects of charge composition and other factors on service life. Evaluates properties of various bodies in terms of phases in the FeO-MnO-SiO_2, FeO-MnO-Al_2O_3, and CaO-SiO_2-Al_2O_3 systems.

Members of the Battelle staff are authors of the recently published articles and books listed on this page. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

Metallographic Study of Electroplated Coatings of Chromium and Nickel on Molybdenum. Roger J. Runck. *Electrochemical Society, Journal,* February 1957, pp. 74-79.

In single-layer coatings, Cr was less subject to bonding failure than Ni and afforded better protection against oxidation. Cracking of Cr coatings was probably a major cause of failure, but good protection was possible if a layer of Cr-Mo alloy was developed at the interface. Undesirable features of electroplated Cr may be overcome by covering it with a layer of Ni.

Why Low Hydrogen Contents Are Desirable in Steel. E. R. Slaughter. *Proceedings of the Thirty-Ninth Conference,* National Open Hearth Committee of the Iron and Steel Division, A.I.M.E. American Institute of Mining, Metallurgical, and Petroleum Engineers, New York. pp. 114-117.

Hydrogen may cause several types of defects in steel and is never beneficial. It is unique among alloying elements in that it reduces ductility without any increase in strength. The tendency for the formation of hydrogen-caused defects is greater in alloy steels than in carbon steels.

Researches on Crystal Orientation in Cold Rolled Recrystallized Iron Sheets, With Regard to Iron Carbonyl. **Richerche Sull'orientamento Cristallino in Lamiere Di Ferro Laminate a Preddo e Ricristallizzate, con Riguardo al Ferro Carbonile.** H. Weik. *Metallurgia Italiana,* v. 48, November 1956, pp. 495-502.

Describes the preparatory treatment given to samples, and then compares the crystal orientation at various stages of processing. Discusses methods for the elimination of undesirable crystal orientations.

Heat Treatment Restores Ductility to Forged Titanium Alloys. D. N. Williams and R. I. Jaffee. *Journal of Metals,* February 1957, pp. 254-260.

Heat-treatment studies of forged compressor wheels were carried out to determine whether wheels rejected due to low ductility could be salvaged by heat treatment. Adequate improvement in ductility was developed by annealing at about 100 F below the β transus, cooling at a low rate to the stabilizing temperature (1200 F), and stabilizing for a short time. The accompanying decrease in strength was slight.

Precision of the Geodimeter as Affected by the Speed of Light in Air. D. T. Williams and John R. Williams. *Review of Scientific Instruments,* February 1957, pp. 108-115.

The geodimeter was analyzed as to limitations on its precision in range measurement imposed by uncertainties in the speed of light. Routine measurements to one part in 10^6 are concluded to be warranted, as far as propagational errors are concerned, up to ranges of about 100 km. Higher precisions, up to one in 10^7, are attainable.

Graphic Arts Research. J. Homer Winkler. *Photoengravers Bulletin,* v. 46, February 1957, pp. 13-20.

After reviewing trends in United States total research effort and research in the graphic arts industry, concludes that research expenditures are not in keeping with the industry's sale volume. Indicates examples where past research investments have paid off generously and dramatically. Points out need for increased research and areas where effort could profitably be applied.

WORLD-WIDE ABSTRACTS

in the FIELDS *of*

289a Aeronautical Engineering
290a Agriculture
292a Biochemistry and Biophysics
296a Ceramics and Concrete
297a Chemical Engineering
299a Chemistry—Analytical
302a Chemistry—Inorganic and General
303a Chemistry—Organic
306a Chemistry—Physical
310a Coatings
311a Control Systems, Computers, and Systems Engineering
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BATTELLE Technical Review ABSTRACTS

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AERONAUTICAL ENGINEERING

6321 Noise Transmission From Boundary Layer Pressure Fluctuations. Robert H. Kraichnan. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 65-80.

A theoretical study of noise spectra radiated by the vibration of thin, stiff, flat plates.

6322 Aerodynamic Components of Aircraft at High Speeds. VII. High Speed Aerodynamics and Jet Propulsion. A. F. Donovan and H. R. Lawrence, editors. 845 p. 1957. Princeton University Press, Princeton, N. J. (TL709 H53)

Aerodynamics of wings and bodies at high speeds; interaction problems; propellers for high speed flight; diffusers and nozzles; nonsteady wing characteristics; experimental aerodynamics of wings at transonic and supersonic speeds.

6323 Direct Solution of the Heat-Balance Equation for Thermal Anti-Icing Systems. Timoleon G. Argyropoulos. *Aeronautical Engineering Review*, v. 16, Feb. 1957, p. 60-63.

6324 Flight-Test Instrumentation for Vertical Take-Off Aircraft. E. R. Hinz and R. A. Fuhrman. *Aeronautical Engineering Review*, v. 16, Feb. 1957, p. 75-81.

6325 Pressure Measurements and Flow Investigation on Delta Wings at Supersonic Speed. G. Drougge and P. O. Larson. *Aeronautical Research Institute of Sweden, Report* 57, 1956, 32 p. (TL504 F67m Vis.)

6326 The Use of Rheoelectrical Analogies in Aerodynamics. L. C. Malavard. *AGARDograph*, no. 18, Aug. 1956, 175 p. (TL565 AG11g Contin.)

Principles, equipment, techniques, and various aerodynamic applications.

6327 Materials Problems Result From New Environments. George L. Christian. *Aviation Week*, v. 66, Feb. 11, 1957, p. 80-83, 85.

Aerodynamic heating, noise, and nuclear radiation affect every component of an aircraft, especially its airframe, powerplant, systems, lubricants, fluids, and vulnerable elastomeric materials.

6328* Computation for an Earth Satellite. Neil D. MacDonald. *Computers and Automation*, v. 6, Feb. 1957, p. 6-9, 23.

Computing facilities planned for tracking the satellite and describing its orbit.

6329 Ground-Controlled Drone Tests Missiles. Forrest Warren and Carlton Corden. *Electronics*, v. 30, Mar. 1, 1957, p. 182-183.

Roll and pitch data systems control drone target used for missile testing at near-sonic speeds. Programmed turns, and climb and dive controls permit operator to maneuver plane over preselected course or to test avoidance techniques.

6330* Operational Angles on the B-47. Richard E. Evans. *Flight and Aircraft Engineer*, v. 71, Jan. 25, 1957, p. 115-117.

Principal operational aspects of high-performance bomber.

6331 The Recovery of High Speed Rocket Powered Vehicles and/or Their Components. Robert Provart. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 125-131, 147.

Basic recovery problem; recovery conditions; programming techniques; impact survival; braking principles; thermal effects.

6332 Heat Transfer to Satellite Vehicles Re-Entering the Atmosphere. N. H. Kemp and F. R. Riddell. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 132-137, 147.

A recently developed theory of heat transfer at high velocities and high altitudes is applied to the problem. Circular reentry orbits are considered for bodies under the influence of gravity and drag forces.

6333 A Generalized Closed Form for Burnt Velocity. Raimond A. Struble and Harold D. Black. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 151-155, 168.

The equation of motion of a rocket, neglecting gravitational field forces, is integrated in closed form to yield a useful, easily applied design equation.

6334 A Two-Dimensional Approximation to the Unsteady Aerodynamics of Rotary Wings. Robert G. Loewy. *Journal of the Aeronautical Sciences*, v. 24, Feb. 1957, p. 81-92, 144.

Expressions for two-dimensional oscillatory airfoil coefficients were derived for rotary wings, taking into account the shed vorticity beneath the plane of the rotor disc.

6335 An Introduction to Second-Order Wing Theory. D. C. M. Leslie. *Journal of the Aeronautical Sciences*, v. 24, Feb. 1957, p. 99-106.

The particular integral for the second-order iteration equation of inviscid supersonic flow is applied to wing theory, enabling calculation of second-order derivatives for wings of finite aspect ratio.

6336 Supersonic Flutter of a Cylindrical Shell. John W. Miles. *Journal of the Aeronautical Sciences*, v. 24, Feb. 1957, p. 107-118.

Examination of aerodynamic instability of traveling waves on a cylindrical shell exposed to an external supersonic air stream and containing an internal fluid.

6337 Dynamic Considerations Relating to the Behavior of Inertial Space-Stabilized Platforms. Edmund Gorczycki. *Journal of the Aeronautical Sciences,* v. 24, Feb. 1957, p. 130-138.

A mathematical analysis revealing factors which must be considered in stable platform design.

6338 Optimum Thickness and Lift Distribution for a Fuselage in the Presence of a Prescribed Wing System. M. E. Graham. *Journal of the Aeronautical Sciences,* v. 24, Feb. 1957, p. 142-144.

6339 Russia's Guided Missile Program. *Missiles and Rockets,* v. 2, Feb. 1957, p. 33-41.

Russians are producing missiles in quantity. The stock pile of anti-aircraft missiles and IRBM's should certainly be regarded with respect, while the imminence of the Russian ICBM is a threat of the first magnitude.

6340* (English.) **Application of the M^2-Expansion Method to Compressible Flow Past Isolated and Lattice Aerofoils.** Isao Imai. *Physical Society of Japan, Journal,* v. 12, Jan. 1957, p. 58-67.

6341* (English.) **Boundary Layer Growth on a Flat Plate With Suction or Injection.** Hidenori Hasimoto. *Physical Society of Japan, Journal,* v. 12, Jan. 1957, p. 68-72.

6342 Effects of Inlet Boundary Layer on Pressure Recovery, Energy Conversion and Losses in Conical Diffusers. F. A. L. Winternitz and W. J. Ramsay. *Royal Aeronautical Society, Journal,* v. 61, Feb. 1957, p. 116-124.

6343 Scientific Uses of Earth Satellites. James A. Van Allen, editor. 316 p. 1956. University of Michigan Press, Ann Arbor. (TL796 V26s)

Papers on optical and visual tracking of a satellite, satellite instrumentation, meteorological measurements from the vehicle, and the possibilities of observing cosmic rays, auroral radiation, the earth's magnetic field, the ionosphere, and meteorites.

6344* Jet Powered VTOL Aircraft. Earl R. Hinz. *Shell Aviation News,* no. 223, Jan. 1957, p. 12-16.

Thrust requirements, suitable engines, control, and weight considerations.

6345 Needed: Materials for Missiles. Specs for Missile Metals. Edward A. Loria. *Steel,* v. 140, Feb. 25, 1957, p. 86-90.

Current research on carbon, alloy metals, elastomers, lubricants, and greases for missiles. Metallurgical requirements of new designs. Thermal properties of high temperature materials.

6346 200 Miles Up. The Conquest of the Upper Air. J. Gordon Vaeth. 2nd Ed. 258 p. 1956. Ronald Press Co., New York. (QC879 V15t2)

Characteristics of the upper atmosphere; instruments and vehicles for high-altitude research; principles of rocket and satellite flight.

6347 Theoretical Calculations of the Pressures, Forces, and Moments at Supersonic Speeds Due to Various Lateral Motions Acting on Thin Isolated Vertical Tails. Kenneth Margolis and Percy J. Bobbitt. *U. S. National Advisory Committee for Aeronautics, Report* 1268, 1956, 44 p. (TL521 Un3r Vis.)

Expressions based on linearized supersonic-flow theory are obtained for the perturbation velocity potentials and pressure distributions due to steady rolling, steady yawing, and constant lateral acceleration.

6348 Low-Speed Static Stability Characteristics of a Complete Model With an M-Wing in Mid and High Positions and With Three Horizontal-Tail Heights. Paul G. Fournier. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* L55JO6, Jan. 1956, 32 p. (TL782 Un3rm Vis.)

6349 Sidewash in the Vicinity of Lifting Swept Wings at Supersonic Speeds. Percy J. Bobbitt and Peter J. Maxie, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3938, Feb. 1957, 49 p. (TL570 Un3t)

Equations and charts for the conical part of the sidewash above and below swept wings at small angles of attack.

6350 Methods for Obtaining Desired Helicopter Stability Characteristics and Procedures for Stability Predictions. F. B. Gustafson and Robert J. Tapscott. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3945, Feb. 1957, 28 p. (TL570 Un3t)

6351 Ditching Investigations of Dynamic Models and Effects of Design Parameters on Ditching Characteristics. Lloyd J. Fisher and Edward L. Hoffman. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3946, Feb. 1957, 58 p. (TL570 Un3t)

6352 Cumulative Fatigue Damage of Aircraft Structural Materials. II. 2024 and 7075 Aluminum Alloy Additional Data and Evaluation. Alfred M. Freudenthal and Robert A. Heller. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 55-273, Oct. 1956, 22 p. (TL507 Un3.18t Contin.)

Effect of randomly varying stress-amplitudes representing gust or manoeuver load sequences encountered in flight.

See also: **6393** (aircraft for agricultural spraying); **7086** (aeronautical developments in Australia); **7205** (photographs in ballistic research); **7267** (design of pressurized aircraft); **7284** (honeycomb sandwich panels in aircraft); **7294** (applications of Be in aircraft); **7305** (Be in aircraft structure); **7395** (fatigue of aircraft structures); **7433** (maching of airfoils); **7603** (assignment of aircraft).

AGRICULTURE

6353 Recharging Ground Water by Irrigation. W. A. Hall, R. M. Hagan, and J. D. Axtell. *Agricultural Engineering,* v. 38, Feb. 1957, p. 98-100.

Excessive irrigation when surplus surface water is available was tried as a supplement to other methods of replenishing ground water supplies. Benefits claimed are weed control and improved hay quality.

6354 Histological Responses of Some Plant Leaves to Hydrogen Fluoride and Sulfur Dioxide. Richard A. Solberg and Donald F. Adams. *American Journal of Botany,* v. 43, Dec. 1956, p. 755-760.

Histological responses to HF and SO_2 were indistinguishable. Various postulates are discussed concerning the means and pathways by which a phytotoxic air pollutant may enter the leaf and produce injury.

6355* Further Observations on the Effect of Carbon Dioxide on the Growth of Etiolated *Avena* Seedlings. C. L. Mer. *Annals of Botany,* v. 21, new ser., Jan. 1957, p. 13-22.

Enhanced growth of the mesocotyl in 5% CO_2 was closely correlated with dry-matter content but not with water content.

6356* Nitrogenous Compounds and Nitrogen Metabolism in the Liliaceae. I. The Occurrence of Soluble Nitrogenous Compounds. II. The Nitrogenous Compounds of Leaves of the Genus *Tulipa:* Environmental Effects on the Composition of *Tulipa Gesneriana*. L. Fowden and F. C. Steward. *Annals of Botany,* v. 21, new ser., Jan. 1957, p. 53-84.

6357* Experimental and Analytical Studies of Pteridophytes. XXXV. The Effects of Direct Applications of Various Substances to the Shoot Apex of *Dryopteris Austriaca* (D. *Aristata*). C. W. Wardlaw. *Annals of Botany,* v. 21, new ser., Jan. 1957, p. 85-120 + 2 plates.

Developments of morphogenetic interest are examined.

6358* The Effect of Carbon Dioxide on the Absorption of Manganese by Root Tissues of Red Beet. A. D. Skelding. *Annals of Botany,* v. 21, new ser., Jan. 1957, p. 121-141.

Absorption is partially inhibited by CO_2.

6359* Potash Fertilizers and Their Behavior. Werner L. Nelson. *Better Crops With Plant Food,* v. 41, Feb. 1957, p. 10-17.

6360* A Study of the Uptake of Silicon and Phosphorus by Wheat Plants, With Radiochemical Methods. L. Rothbuhr and F. Scott. *Biochemical Journal*, v. 65, Feb. 1957, p. 241-245.

Even young wheat plants show a significant capacity to absorb silica. Added phosphate slightly depressed the uptake of silicate, and added silicate enhanced the absorption of phosphate, showing the close relation of their metabolism.

6361* Blade Tissue Organization of Foliage Leaves of Some Carolina Shrub-Bog Species as Compared With Their Appalachian Mountain Affinities. Jane Philpott. *Botanical Gazette*, v. 118, Dec. 1956, p. 88-105.

Leaf blades of 27 species were examined.

6362* Effects of Gibberellic Acid on Growth and Development of Plants of Various Genera and Species. Paul C. Marth, William V. Audia, and John W. Mitchell. *Botanical Gazette*, v. 118, Dec. 1956, p. 106-111.

In the 49 kind of plants studied the most obvious response was stem elongation.

6363* Translocation and Distribution of Radioactive Phosphorus in Wheat. J. C. Frazier, J. F. Schaff, R. E. Hein, and R. H. McFarland. *Botanical Gazette*, v. 118, Dec. 1956, p. 122-127.

Rate of uptake and translocation of P from nutrient solutions to the developing kernel. Sites of deposition in the mature wheat kernel.

6364* The Response of Grape Tissue Cultures to Inoculation With Biochemical Mutants of Erwinia Aroideae. E. D. Garber and M. Goldman. *Botanical Gazette*, v. 118, Dec. 1956, p. 128-130.

Macerated surfaces reacted more quickly and more severely than did intact surfaces, and the different mutants varied in rates of attack.

6365* Effects of 2,4 - Dichlorophenoxyacetic Acid and Maleic Hydrazide on Free Amino Acids and Proteins in Potato, Sugar-Beet, and Bean Tops. Jess L. Fults and Merle G. Payne. *Botanical Gazette*, v. 118, Dec. 1956, p. 130-133.

6366* On the Photochemical Degradation of 2,4-Dichlorophenoxyacetic Acid and Structurally Related Compounds in the Presence and Absence of Riboflavin. Gordon R. Bell. *Botanical Gazette*, v. 118, Dec. 1956, p. 133-136.

Structure of the side chain determines whether or not a phenoxy compound will be decomposed to the corresponding phenol by photoactivated riboflavin.

6367 Developmental Studies of Elodea Canadensis Michx. I. Morphological Development at the Shoot Apex. II. Experimental Studies on Morphological Effects of Darkness. Hugh M. Dale. *Canadian Journal of Botany*, v. 35, Jan. 1957, p. 13-24, 51-63 + 5 plates.

6368* Qualitative Studies of Soil Microorganisms. XIV. Specific Vitamin Requirements of the Predominant Bacterial Flora. A. G. Lochhead and Margaret O. Burton. *Canadian Journal of Microbiology*, v. 3, Feb. 1957, p. 35-42.

The vitamins found to be essential, either alone or with others, were, in order of frequency, thiamine, biotin, vitamin B_{12}, panthothenic acid, folic acid, nicotinic acid, and riboflavin.

6369* Studies on Methods and Materials for Testing Alfalfa for Resistance to Bacterial Wilt. M. W. Cormack, R. W. Peake, and R. K. Downey. *Canadian Journal of Plant Science*, v. 37, Jan. 1957, p. 1-11 + 1 plate.

The root-ball soak method proved particularly rapid and effective for greenhouse tests. In the field, best results were obtained with bare-root soak inoculation before transplanting, and with hypodermic injection of the roots in the fall.

6370* A Comparison of MCP and 2,4-D for the Control of Annual Weeds in Grain Crops. H. A. Friesen and D. R. Walker. *Canadian Journal of Plant Science*, v. 37, Jan. 1957, p. 69-81 + 1 plate.

MCP is favored over 2,4-D with either oats or flax.

6371 EPTC. *Farm Chemicals*, v. 120, Feb. 1957, p. 44-47.

Ethyl N,N-di-n-propylthiocarbamate was effective in controlling all of the grasses and many of the major broadleaf weeds against which it was tested. It must be applied before the weeds emerge.

6372* Polyphenoloxidase and Ascorbic Acid Oxidase Activity in Tomato Plants Infected With *Fusarium Lycopersici* Sacc. B. D. Sanwal. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Nov. 1956, p. 257-270.

6373* Carbon Nitrogen Metabolism of Soil Fungi. I-II. S. Natarajan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Nov. 1956, p. 289-310.

Metabolism of *Fusarium vasinfectum* and *Fusarium udum* associated with the wilt of cotton and *Cajanus cajan* respectively, was studied.

6374* Physiology of Host-Parasite Relationships in the *Fusarium* Wilt of Cotton. I. Pectin Metabolism. K. Lakshminarayanan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Dec. 1956, p. 317-324.

The role of pectic enzyme systems of the pathogen *F. vasinfectum* in derangement of the host pectin metabolism.

6375 Phosphate Fertilizers: Processing vs. Performance. W. L. Hill. *Journal of Agricultural and Food Chemistry*, v. 5, Feb. 1957, p. 96-101.

An understanding of fertilizer-soil-plant interactions is important in processing fertilizers for greatest reactivity, especially with reference to granulation.

6376 Toxic Action of Metal Ions to Fungus Spores. Lawrence P. Miller and S. E. A. McCallan. *Journal of Agricultural and Food Chemistry*, v. 5, Feb. 1957, p. 116-122.

Silver is taken up rapidly by fungus spores, so that germination can be completely inhibited after a contact time of one minute or less. Only Hg and Cu offer serious competition. Zinc, Cu, and Cd reduce germination appreciably only after some hours of contact with the spores.

6377 Metabolism of Insecticides—Permanganate Oxidation Products of Schradan. E. Y. Spencer, R. D. O'Brien, and Robert W. White. *Journal of Agricultural and Food Chemistry*, v. 5, Feb. 1957, p. 123-127.

Active component is a potent anticholinesterase, rather unstable in aqueous solutions, which readily forms heptamethylpyrophosphoramide, and has a partition coefficient similar to the biologically produced material.

6378* Effect of Auremycin on Young Dairy Calves Raised in a New Environment. F. T. Landagora, L. L. Rusoff, and Barney Harris, Jr. *Journal of Dairy Science*, v. 40, Jan. 1957, p. 50-55.

Aureomycin increased in weight and feed utilization efficiency of Holstein and Jersey calves, and more so when they were kept in a sanitary environment.

6379* Stocking, Normality, and Measurement of Stand Density. C. Allen Bickford. *Journal of Forestry*, v. 55, Feb. 1957, p. 99-104.

Existing concepts of forest stocking; various ways for measurement; research needed.

6380* Effects of Glaze on the Development of Appalachian Hardwoods. K. L. Carvell, E. H. Tryon, and R. P. True. *Journal of Forestry*, v. 55, Feb. 1957, p. 130-132.

Survey of damage after a severe ice storm.

6381* Effects of Prescribed Burning in Ponderosa Pine. Harold Weaver. *Journal of Forestry*, v. 55, Feb. 1957, p. 133-138.

Prescribed burning resulted in significant reduction in fire hazard and in silvicultural benefit.

6382 The Toxicity of Organic Sulphides to the Eggs and Larvae of the Glasshouse Red Spider Mite. I. SS'-Disubstituted Alkane-$\alpha\omega$-Dithiols. R. F. Brookes, J. E. Cranham, W. A. W. Cummings, D. Greenwood, B. S. Jackson, and H. A. Stevenson. *Journal of the Science of Food and Agriculture*, v. 8, Jan. 1957, p. 31-38.

6383 Analytical Studies on the Carbohydrates of Grasses and Clovers. VIII. Changes in Carbohydrate Composition During the Growth of Perennial Rye-Grass. D. J. Mackenzie and Clare B. Wylam. *Journal of the Science of Food and Agriculture*, v. 8, Jan. 1957, p. 38-45.

Although there were individual variations in the amounts of glucose, fructose, and sucrose present, no major seasonal trends in these sugars were evident.

6384 Studies in Selective Toxicity. III. Benzenesulphonanilides as DDT-Synergists. M. Neeman, G. G. Mer, R. Cwilich, A. Modiano, and S. Zacks. *Journal of the Science of Food and Agriculture*, v. 8, Jan. 1957, p. 55-64.

Benzenesulphonanilides with halogen or methyl substituents in the phenyl radicals, with or without *N*-alkyl substituents, were assayed as DDT-synergists against DDT-resistant houseflies.

6385* (English.) **Studies on the Biological Assay of Insecticides. XXXIX. On the Difference in Susceptibility to the Knockdown Effect of *p,p'*-DDT Powder Between Adults of the Common House Fly, *Musca domestica vicina* Macq., Reared on the Culture Medium Prepared With the Horse Manure and Those on "Okara," the Residual Product in "Tofu" Making.** Sumio Nagasawa. *Kyoto University, Institute for Chemical Research, Bulletin*, v. 34, May 1956, p. 101-116.

6386 Antibiotics and Plant Protection. G. V. Hopwood. *Manufacturing Chemist*, v. 28, Jan. 1957, p. 5-8.

A survey of progress in developing antibiotics for the prevention of bacterial, fungal, and viral diseases of plants.

6387* (Polish.) The Efficacy of Insecticides of the DDT and HCH Type. **W sprawie skuteeznego działania insektycydów typu DDT i HCH.** Z. Szymusik. *Przemysł Chemiczny*, v. 12, Nov. 1956, p. 616-619.

Study of the immunity developed by insects to various compounds and suggestions for overcoming this immunity.

6388* (Polish.) Investigation of the Fertilizer Value of Magnesium Thermophosphate. **Badania nad wartością nawozowa termofosfatu magnezowego.** M. Koter and H. Panak. *Przemysł Chemiczny*, v. 12, Dec. 1956, p. 682-687.

The magnesium thermophosphate was compared with a calcined phosphate and with indigenous phosphorite meal.

6389 New Pyrethrum Synergist. J. H. Fales, O. F. Bodenstein, and Morton Beroza. *Soap and Chemical Specialties*, v. 33, Feb. 1957, p. 79-82.

Evaluation of a 3,4-methylenedioxyphenyl acetal as synergist for pyrethrins and allethrin against house flies, mosquitoes, roaches, and Japanese beetles.

6390 Insect Attractants and Repellents. V. G. Dethier. *Soap and Chemical Specialties*, v. 33, Feb. 1957, p. 83-87, 117.

Methods of testing tick and flea repellents and other insect repellents used on skin and clothing. (To be concluded.)

6391* Chemical and Biological Aspects of Soil Sterilization. J. H. Warcup. *Soils and Fertilizers*, v. 20, Feb. 1957, p. 1-5.

A review of microbiological studies indicating the effect of various partial sterilizing agents on the general population of microorganisms in soil.

6392* Chemical Control of Small-Diameter Scrub Oak. R. D. Shipman and H. R. Scott. *Southern Lumberman*, v. 194, Mar. 1, 1957, p. 64 + 1 page.

Experiments with Ammate and 2,4,5-T applied in various ways.

6393 Aerial Spraying Studies. R. F. Hill and R. T. Jarman. *World Crops*, v. 9, Feb. 1957, p. 55-59.

Aircraft types; spray characteristics; spraying equipment.

6394 Ultra-Low-Volume Spraying in Africa. G. J. Rose. *World Crops*, v. 9, Feb. 1957, p. 60-62.

Spraying experiments on coffee, cereals, maize, wattle trees, orchards, cotton, and bananas.

6395 The World Fertilizer Economy. Mirko Lamer. 715 p. 1957. Stanford University Press, Stanford, Calif. (S633 L18w)

Effect of World War II on the forms and uses of commercial fertilizers. Information on production, consumption, foreign trade, soil science, plant physiology, chemistry, and manufacturing processes.

See also: **6425** (nitrifying bacteria); **6533** (fertilizer manufacture); **6582** (pesticide analysis); **6596** (determination of DDT in cotton dusts); **6597** (determination of organic pesticides); **6610** (determination of DDT and BHC); **6611** (analysis of forages); **6681** (fluorine systemic insecticide); **6714** (organotin biocides); **7059** (budgeting in farm management); **7723** (effects of air pollution on plants); **7862** (forest resources).

BIOCHEMISTRY AND BIOPHYSICS

6396* (English.) **Changes in Glycogen and Nitrogen-Containing Compounds in *Escherichia coli B* during Growth in Deficient Media. II. Phosphorus and Sulphur Starvation.** T. Holme and H. Palmstierna. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1553-1556.

6397 Advances in Virus Research. Kenneth M. Smith and Max A. Lauffer, editors, v. IV. 340 p. 1957. Academic Press, New York. (QR360 Ad95 Vis.)

Factors in virus evolution; bacteriophages as genetic and biochemical systems; anatomy of tobacco mosaic viruses; effect of changing temperature on plant virus diseases; mechanical transmission of plant viruses; influenza viruses.

6398 The Molecular Weight of Insulin in Dioxane-Water Solutions. Eugene Fredericq. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 599-601.

6399 Phytin Elimination in Soybean Protein Isolation. Allan K. Smith and Joseph J. Rackis. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 633-637.

Phytin can be eliminated from water extract of soybean meal by a combination of dialysis and treatment with the anion-exchange resin Dowex-1-X10.

6400 The Use of Benzylsulfonyl Chloride in Peptide Syntheses. H. Bayard Milne and Chi-Hsieh Peng. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 639-644.

N-Benzylsulfonyl derivatives of 25 amino acids were prepared and characterized. This group is easily cleaved from amino acid derivatives by Na in liquid ammonia or Raney nickel.

6401 An Alanine-Dependent, Ribonuclease-Inhibited Conversion of AMP to ATP, and Its Possible Relationship to Protein Synthesis. Robert W. Holley. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 658-662.

An enzyme preparation from the soluble fraction of rat liver homogenate brings about conversion in the presence of l-alanine. Reaction is inhibited by ribonuclease.

6402 The Synthesis of Ribose 5-Pyrophosphate and Ribose 5-Triphosphate. B. L. Horecker, J. Hurwitz, and L. A. Heppel. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 701-702.

6403 Studies of the Motile Cells of Chytrids. I. Electron Microscope Observations of the Flagellum, Blepharoplast and Rhizoplast. William J. Koch. *American Journal of Botany*, v. 43, Dec. 1956, p. 811-819.

6404 Some Properties of the Lipase Present in Germinating Rapeseed. L. R. Wetter. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 66-70.

The lipase content of rapeseed germinated in light increases by 100-fold over that of the dormant seed.

6405 A Comprehensive Review of Ataraxics, Sedatives, Tranquilizers. Samuel W. Goldstein. *American Pharmaceutical Association, Journal (Practical Pharmacy Ed.)*, v. 18, Feb. 1957, p. 92-96.

Includes tabulated trade names, generic names, chemical description, type of action, and dosage forms of numerous drugs, plus background notes on their use.

6406* (German.) Amino Sugar. **Aminozucker.** Richard Kuhn. *Angewandte Chemie*, v. 69, Jan. 7, 1957, p. 23-33.

Discovery of glucosamine, existence of amino sugar in nature, biosynthesis of these compounds. The example of blood group substances is used to indicate the importance for problems of genetics. Synthesis of D-glucosamine, D-galactosamine, N-acetyl lactosamine, and additional 2-desoxy-2-amino-sugars by catalytic semi-hydrogenation of amino nitriles.

6407* Keto-Acids in the Alga *Chlorella*. J. W. Millbank. *Annals of Botany*, v. 21, new ser., Jan. 1957, p. 23-31.

Very small amounts of keto-acids are found in *Chlorella* when grown autotrophically, but much higher levels form under heterotrophic conditions and in nitrogen starvation.

6408* Studies in the Physiology of Parasitism. XXIII. On the Parasitic Vigour of Certain Bacteria in Relation to Their Capacity to Secrete Pectolytic Enzymes. D. H. Lapwood. *Annals of Botany*, v. 21, new ser., Jan. 1957, p. 167-184.

Three organisms, *Flavobacterium* sp., *Pseudomonas sp.* No. 169, and *Pseudomonas syringae*, were compared with a pathogen *Bacterium aroideae*.

6409* A New Sterility Test for Antibiotics. An Application of the Membrane Filter Technique. Simon Holdowsky. *Antibiotics & Chemotherapy*, v. 7, Feb. 1957, p. 49-54.

Use of a membrane filter to separate contaminating bacteria from antibiotic preparations.

6410* 6-Dizao-5-Oxo-L-Norleucine, a New Tumor-Inhibitory Substance. V. Microbiologic Studies of Mode of Action. Richard E. Maxwell and Violet S. Nickel. *Antibiotics & Chemotherapy*, v. 7, Feb. 1957, p. 81-89.

This compound was found to be a powerful inhibitor of the growth of E. *coli* in a synthetic medium and interfered with the incorporation of glycine and formate, but not of adenine, into nucleic acids. Inhibition was not antagonized by aromatic amino acids but was readily antagonized at lower levels by adenine, guanine, hypoxanthine, and the corresponding mucleosides, and by guanosine-2'(3')-phosphate.

6411* The Effect of pH, Temperature, and Composition of the Medium on Growth Characteristics of *Rhodotorula Gracilis*. C. H. Spotholz, J. H. Litchfield, and Z. J. Ordal. *Applied Microbiology*, v. 4, Nov. 1956, p. 285-288.

6412* The Coexistence of Pathogens and Pseudomonads in Soluble Oil Emulsions. R. Samuel-Maharajah, Hilliard Pivnick, W. E. Engelhard, and Sheila Templeton. *Applied Microbiology*, v. 4, Nov. 1956, p. 293-299.

6413* An Appraisal of the Soluble Gelatin Foam Filter as a Sampler for Bacterial Aerosols. Eric Noller and J. Clifton Spendlove. *Applied Microbiology*, v. 4, Nov. 1956, p. 300-306.

The gel-foam filter is as efficient a sampler of spore aerosols as is the all-glass impinger. It is an unsatisfactory sampler of vegetative bacterial cells.

6414* Factors Affecting a Routine Novobiocin Cylinder-Plate Assay. Dale A. Harris, Robert B. Walton, Armen H. Bulbulian, and Jean O. Murphy. *Applied Microbiology*, v. 4, Nov. 1956, p. 307-310.

Combining the addition of 0.25% glucose to the basic assay medium, the use of pH 6.0 phosphate buffer, and 7.5 ml. medium volume resulted in a 6-fold increase in assay sensitivity and good zone clarity.

6415* *Mycobacterium Paraffinicum* n. sp., a Bacterium Isolated From Soil. J. B. Davis, H. H. Chase, and R. L. Raymond. *Applied Microbiology*, v. 4, Nov. 1956, p. 310-315.

Bacterium utilizes ethane and other gaseous and liquid paraffinic hydrocarbons for growth, but not methane. Complex organic media are not utilized.

6416* The Conversion of Mannitol to Fructose by *Acetobacter Suboxydans*. Merlin H. Peterson, Waldo C. Friedland, Frank W. Denison, Jr., and J. C. Sylvester. *Applied Microbiology*, v. 4, Nov. 1956, p. 316-322.

6417* The Isolation of Pathogenic Bacteria From Used Emulsion Oils. C. O. Tant and E. O. Bennett. *Applied Microbiology*, v. 4, Nov. 1956, p. 332-338.

Isolation of 26 species showed a higher number of gram negative than gram positive organisms.

6418* The Inhibitory Action of Agar on Certain Strains of Pleuropneumonia-Like Organisms. Raymond J. Lynn and Harry E. Morton. *Applied Microbiology*, v. 4, Nov. 1956, p. 339-341.

Certain lots of agar were found unsatisfactory for the cultivation of some strains.

6419* New Enrichment and Plating Media for the Isolation of *Salmonella* and *Shigella* Organisms. A. A. Hajna and S. R. Damon. *Applied Microbiology*, v. 4, Nov. 1956, p. 341-345.

6420* Maintenance of Cultures Under Paraffin Oil. S. E. Hartsell. *Applied Microbiology*, v. 4, Nov. 1956, p. 350-355.

Both the longevity and the maintenance of cultural characteristics depend upon the strain, the storage medium, temperature, subculturing medium, and frequency and technique of transfer.

6421* Effect of Temperature on Microbial Proliferation in Shell Eggs. J. C. Ayres and Betty Taylor. *Applied Microbiology*, v. 4, Nov. 1956, p. 355-359.

6422* The Biochemistry of Hydrogenomonas. V. Factors Affecting Autotrophic Fixation of Carbon Dioxide. Bruce A. McFadden and Daniel E. Atkinson. *Archives of Biochemistry and Biophysics*, v. 66, Jan. 1957, p. 16-22.

Fixation by *Hydrogenomonas facilis* is enhanced by a N supply and is inhibited by iodoacetate, *p*-chloromercuribenzoate, 2,4-dinitrophenol, ethylenediaminetetraacetic acid, α,α'-dipyridyl, and thioglycolic acid at concentrations having little or no effect on the energy-yielding oxidation of H.

6423* Observations on the Oxyhydrogen Reaction in *Scenedesmus* and Its Relation to Respiration and Photosynthesis. Leonard Horwitz. *Archives of Biochemistry and Biophysics*, v. 66, Jan. 1957, p. 23-44.

Data emphasize kinship of the oxyhydrogen reaction to respiration rather than to photosynthesis.

6424* The Effect of Antimetabolites on the Growth of *Endamoeba histolytica*. I. Purine and Pyrimidine Analogs. Mitsuru Nakamura and Sigurdur Jonsson. *Archives of Biochemistry and Biophysics*, v. 66, Jan. 1957, p. 183-189.

6425* The Biochemistry of the Nitrifying Organisms. V. Nitrite Oxidation by *Nitrobacter*. H. Lees and J. R. Simpson. *Biochemical Journal*, v. 65, Feb. 1957, p. 297-305.

Studies suggest that a cytochrome with an absorption maximum at 551 mμ. in the reduced state is intimately concerned with the nitrite oxidation.

6426* The Nature of the Fluctuating Ribonucleic Acid in *Escherichia coli*. H. E. Wade and D. M. Morgan. *Biochemical Journal*, v. 65, Feb. 1957, p. 321-331.

6427* The Interconversion of Serine and Glycine: Preparation and Properties of Catalytic Derivatives of Pteroylglutamic Acid. R. L. Blakley. *Biochemical Journal*, v. 65, Feb. 1957, p. 331-342.

6428* (Russian.) Changes of Substrates of Lipid Metabolism and of the Lipoxidase Activity Produced by Ionizing Radiations. **Izmenenie substratov lipidnogo obmena i aktivnosti lipoksidazy pri deistvii ioniziruiushchego izlucheniia.** E. V. Budnitskaya, I. G. Borisova, and A. G. Passynsky. *Biokhimiia*, v. 21, Nov.-Dec. 1956, p. 702-708.

6429* (Russian.) The Effect of Thyroidine and 6-Methylthiouracil Upon Adrenalin Metabolism in Striated Muscles and Brain. **Vliianie tireoidina i 6-metiltiouratsila na obmen adrenalina v skeletnykh myshtsakh i golovnom mazgu.** A. M. Utevsky and M. L. Butom. *Biokhimiia*, v. 21, Nov.-Dec. 1956, p. 776-783.

Administration of thyroidine results in the disappearance from the muscles of the reversibly oxidized form of adrenaline-like substances and also a decrease in the "specificity coefficient".

6430 (English and German.) **Borderland Problems Between Physical Chemistry and Physiology.** Y. Asami and K. Higasi, editors. 130 p. 1955. Research Institute of Applied Electricity, Hokkaido University, Sapporo, Japan. (QH505 As13b)

Seven papers on various aspects of biophysics. Pertinent papers are individually abstracted.

6431 The Oxygen Equilibrium and Magnetic Susceptibility of Hemerythrin. Masaji Kubo. Paper from "Borderland Problems Between Physical Chemistry and Physiology". Research Institute of Applied Electricity, Hokkaido University, p. 37-52. (QH505 As13b)

6432 Some Aspects of the Biological Effects of Ionizing Radiations. Masaru Wakabayashi and Fumio Kawamura. Paper from "Borderland Problems Between Physical Chemistry and Physiology". Research Institute of Applied Electricity, Hokkaido University. p. 91-100. (QH505 As13b)

Physicochemical processes which follow energy absorption when ionizing radiation causes biological effects.

6433 Coalescence as a Factor in Solvent Stimulation of Plastid Phosphatidase C Activity. Morris Kates and Paul R. Gorham. *Canadian Journal of Biochemistry and Physiology*, v. 35, Feb. 1957, p. 119-126 + 1 plate.

Stimulating solvents achieve their effect primarily by causing substrate and plastid phases to coalesce; the enzymatic reaction actually proceeds in the coalesced phase.

6434 A Comparative Study of Fungitoxicity and Phytotoxicity in an Homologous Series of N-*n*-Alkylethylenethioureas. R. G. Ross and R. A. Ludwig. *Canadian Journal of Botany*, v. 35, Jan. 1957, p. 65-95 + 3 plates.

Fungitoxicity increased with increasing chain length up to and including the octyl homologue followed by a sharp decline in the higher member of the series. The peak of maximum phytotoxicity depended on the availability of the compounds to the plant cells.

6435 Constitution of a Degraded Polysaccharide From Wheat Bran. J. Schmorak, C. T. Bishop, and G. A. Adams. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 108-114.

Methylation studies, periodate oxidation data, and hypoiodite end group estimations showed that the degraded polysaccharide was composed of repeating units of 7-8 d-xylopyranose residues joined by β, 1→4 linkages.

6436* Lysozyme in the Bacteriolysis of Gram-Negative Bacteria. I. Morphological Changes During Use of Nakamura's Technique. II. Factors Influencing Clearing During the Nakamura Treatment. E. A. Grula and S. E. Hartsell. *Canadian Journal of Microbiology*, v. 3, Feb. 1957, p. 13-34 + 6 plates.

6437* The Feulgen Reaction in the Unsectioned Macro Yeast Cell. G. Fred Townsend. *Canadian Journal of Microbiology*, v. 3, Feb. 1957, p. 43-45 + 1 plate.

The Feulgen strain was applied to cells derived from *Saccharomyces cerevisiae*, and Feulgen-positive areas were readily located. Staining could be found at only one point outside of the vacuole. This point was considered as the location of the yeast cell nucleus.

6438 Amino-Sugars and Related Compounds. II. Observations on the Acidic Hydrolysis of Derivatives of 2-Amino-2-Deoxy-*D*-Glucose (*D*-Glucosamine). A. B. Foster, D. Horton, and M. Stacey. *Chemical Society, Journal*, Jan. 1957, p. 81-86.

6439 Chemical Action of Ionising Radiations in Solution. XVII. Degradation of Deoxyribonucleic Acid in Aqueous Solution by Irradiation With X-Rays (200 kv). M. Daniels, G. Scholes, J. Weiss, and C. M. Wheeler. **XVIII. Action of X-Rays (200 kv) on α- and β-Glycerophosphate in Aqueous Solution.** G. Scholes, W. Taylor, and J. Weiss. **XIX. Some Aspects of the Reduction of Methylene-Blue by X-Rays in Aqueous Systems.** E. Hayon, G. Scholes, and J. Weiss. *Chemical Society, Journal*, Jan. 1957, p. 226-246, 301-311.

6440 Synthetic Plant Hormones. IV. Aryloxymethylphosphinic Acids. M. H. Maguire and G. Shaw. *Chemical Society, Journal*, Jan. 1957, p. 311-314.

Several acids were prepared by the reduction of aryloxymethylphosphonic dichlorides with Li Al hydride and aerial oxidation of the products.

6441 Studies in Relation to Biosynthesis. IX. The Structure of Spherophysine. A. J. Birch, D. G. Pettit, and R. Schofield. **X. A Synthesis of Lumichrome From Non-Benzenoid Precursors.** A. J. Birch and C. J. Moye. *Chemical Society, Journal*, Jan. 1957, p. 410-414.

6442* (Russian.) Comparative Studies on the Composition of the Nucleic Acids in Different Age Cultures of *Bacterium Coli*. **Sravnitel'noe izuchenie sostava nukleonovykh kislot u kultur kishechnoi palochki razlichnykh vozrastov.** A. S. Spirin, A. N. Belozerskii, and A. Pretel'-Martines. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1297-1299.

Change in the composition of the ribonucleic and deoxyribonucleic acids during growth.

6443* Federal Grants and Contracts for Unclassified Research in the Life Sciences, Fiscal Year 1955. 218 p. 1956. National Science Foundation, Washington, D. C. (Q180 N21f)

6444 2-Deoxy-D-Glucose, a New Substrate for Glucose Oxidase (Glucose Aerodehydrogenase). R. B. McComb, W. D. Yushok, and William G. Batt. *Franklin Institute, Journal*, v. 263, Feb. 1957, p. 161-165.

Activity as a substrate for this enzyme is intermediate between that of highly active glucose and that of the other known substrates, all of which are nearly inactive.

6445* Isolation of *Cercospora Personata*, Its Sporulation and Growth in Pure Culture. P. Shanta. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Nov. 1956, p. 271-275.

An isolate of the causal organism of the "Tikka disease" or leaf spot of *Arachis hypogea*, was shown to be easily culturable.

6446* A New Technique for the Permanent Dry Preservation of Some Mycological and Plant Pathological Specimens. B. B. Sharma and B. N. Saxena. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Nov. 1956, p. 276-277 + 1 plate.

Consists of treatment with alcohol, pylene, and xylene + Canadian balsam.

6447* Some Observations on the Living Cells of *Saccharomyces Carlsbergensis* From Twenty Four-Hour Agar Slants With Phase Contrast and Dark Ground Illumination. T. R. Thyagarajan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Nov. 1956, p. 278-288 + 2 plates.

6448* Phenomena Preceding Sporulation in *Schizosaccharomyces Octosporus*. Saraswathy Royan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. B, Nov. 1956, p. 311-315 + 1 plate.

6449* Large-Scale Experiments on the Effect of Chloromycetin and Glycine in the Nutrition of Silkworm *Bombyx Mori*, L. K. Sharada, Leena T. Shroff, M. B. Shyamala, K. Shama Iyengar, and J. V. Bhat. *Indian Institute of Science, Journal*, v. 38, sec. A, Oct. 1956, p. 220-223.

6450* Avian Malaria and B-Complex Vitamins. III. Para-Amino-Benzoic Acid. R. Rama Rao and M. Sirsi. *Indian Institute of Science, Journal*, v. 38, sec. A, Oct. 1956, p. 224-227.

Biochemical alterations with particular reference to B-complex vitamins in the blood of *P. gallinaceum* infected chicken.

6451* Biochemical Tests for the Differentiation of *Klebsiella* and *Cloaca*. E. Hormaeche and M. Munilla. *International Bulletin of Bacteriological Nomenclature and Taxonomy*, v. 7, Jan. 1957, p. 1-20.

Separation should be based on motility; urea hydrolysis; gas production from nonsoluble starch, inositol, and glycerol; the arginine dihydrolase test; gelatin liquefaction and IMViC reactions.

6452* (Italian.) Antonio Baselli Conference: "Macromolecules of the Living". **Convegno Antonio Baselli "le macromolecole dei viventi".** *Istituto Lombardo di Scienze e Lettere, Rendiconti, Classe di Scienze Matematiche e Naturali*, v. 89, July 1955, 348 p.

A collection of 18 papers on biological molecules, their structure, biosynthesis and function. Topics covered include proteins, nucleic acids, polysaccharides, polypeptide chain configurations, and biological motility.

6453 Concentration Effects in the Enzymatic Conversion of Lactose to Oligosaccharides. Henry R. Roberts and J. D. Pettinati. *Journal of Agricultural and Food Chemistry*, v. 5, Feb. 1957, p. 130-134.

6454* Biosynthesis of Methionine From Homocysteine and s-Methylmethionine in Bacteria. Stanley K. Shapiro. *Journal of Bacteriology*, v. 72, Dec. 1956, p. 730-735.

6455* Electron Microscopic Study of Phagocytosis of Staphylococcus by Human Leukocytes. II. Virulent and Non-Virulent Staphylococci. J. R. Goodman, R. E. Moore, and R. F. Baker. *Journal of Bacteriology*, v. 72, Dec. 1956, p. 736-745.

After phagocytosis the virulent strains of *Staphylococcus aureus* multiplied within the neutrophils and destroyed them. The non-virulent strain was destroyed by the neutrophil in some manner which involved a process of swelling and vacuolation of the bacterium.

6456* A Cyclic Pathway for the Bacterial Dissimilation of 2,3-Butanediol, Acetylmethylcarbinol and Diacetyl. II. The Synthesis of Diacetylmethylcarbinol From Diacetyl, a New Diphosphothiamin Catalyzed Reaction. Elliot Juni and Gloria A. Heym. *Journal of Bacteriology*, v. 72, Dec. 1956, p. 746-753.

6457* Penicillinase of *Escherichia Coli* and Its Relation to a Penicillin-Binding Component. Samuel Liberman and Marvin J. Johnson. *Journal of Bacteriology*, v. 72, Dec. 1956, p. 831-833.

The cell component causing penicillin destruction was not identical with the component, essential for normal growth, which is inactivated by penicillin.

6458* Enzymatic Formation of Uridine Diphosphoglucuronic Acid. Jack L. Strominger, Elizabeth S. Maxwell, Julius Axelrod, and Herman M. Kalckar. *Journal of Biological Chemistry*, v. 224, Jan. 1957, p. 79-90.

The soluble fraction of liver homogenate is shown to contain an enzyme, uridine diphosphoglucose dehydrogenase, which catalyzes a two-step oxidation of uridine diphosphoglucose to uridine diphosphoglucuronic acid.

6459* Rhamnose and Rhamnolipide Biosynthesis by *Pseudomonas Aeruginosa*. George Hauser and Manfred L. Karnovsky. *Journal of Biological Chemistry*, v. 224, Jan. 1957, p. 91-105.

6460* ω-Amide and ω-Amino Acid Derivatives of α-Ketoglutaric and Oxalacetic Acids. Theodore T. Otani and Alton Meister. *Journal of Biological Chemistry*, v. 224, Jan. 1957, p. 137-148.

6461* α-Hydroxysulfonates as Inhibitors of the Enzymatic Oxidation of Glycolic and Lactic Acids. Israel Zelitch. *Journal of Biological Chemistry*, v. 224, Jan. 1957, p. 251-260.

The α-hydroxysulfonates studied effectively inhibit the enzymatic oxidation of L(+)-lactate by glycolic acid oxidase and by muscle lactic dehydrogenase, but are less effective in inhibiting the oxidation of D-glycerate and are ineffective against the oxidation of L-malate.

6462* Glucose Oxidation and Cytochromes in Solubilized Particulate Fractions of *Acetobacter Suboxydans*. Tsoo E. King and Vernon H. Cheldelin. *Journal of Biological Chemistry*, v. 224, Jan. 1957, p. 579-590.

6463* Cytochemical Studies of Mitochondria. I. The Separation and Identification of a Membrane Fraction From Isolated Mitochondria. II. Enzymes Associated With a Mitochondrial Membrane Fraction. Philip Siekevitz and Michael L. Watson. *Journal of Biophysical and Biochemical Cytology*, v. 2, Nov. 1956, p. 639-669 + 7 plates.

6464* Electron Microscopic Observations on the Submicroscopic Morphology of the Meiotic Nucleus and Chromosomes. E. De Robertis. *Journal of Biophysical and Biochemical Cytology*, v. 2, Nov. 1956, p. 785-795 + 4 plates.

Although the fine structure of the chromosome and chromatin material undergoes profound and complex cyclic rearrangements during meiosis of the grasshopper spermatocyte, in all stages a filamentous macromolecular component can be recognized as the basic structural unit.

6465* Investigations of the Behavior of *Paramecium Aurelia*. V. The Effects of Autogamy (Nuclear Reorganization). Beatrice Gelber and Ellen Rasch. *Journal of Comparative and Physiological Psychology*, v. 49, Dec. 1956, p. 594-599.

Percentage of autogamy increases linearly from almost nothing to almost 100 in the fourth to fifteenth fissions since previous autogamy, if the animals are starved. The animals can feed during the entire period of autogamy.

6466* Interrelationships of Microorganisms in Cream. II. *Lactobacillus Casei, Bacillus Subtilis, and Streptococcus Lactis*. III. *Candida Pseudotropicalis, Aerobacter Aerogenes, and Streptococcus Lactis*. L. G. Harmon and F. E. Nelson. *Journal of Dairy Science*, v. 40, Jan. 1957, p. 1-18.

Bacteria were inoculated individually and in combination with *Streptococcus lactis* into sterile cream which was incubated at different temperatures and analyzed for protein and fat decomposition, pH, growth, and flavor changes.

6467* The Role of a Contaminant in Thrombin in the Human Plasmin Assay System. Malcolm Siegel and Eugene E. Cliffton. *Journal of General Physiology*, v. 40, Jan. 1957, p. 377-392.

6468* Calcium Equilibrium in Muscle. Daniel L. Gilbert and Wallace O. Fenn. *Journal of General Physiology*, v. 40, Jan. 1957, p. 393-408.

Effect of various conditions on the Ca content in frog muscle. Uptake of Ca^{45} by sartorius muscle, Achilles tendon, and gastrocnemius muscle.

6469* Protein Synthesis in Isolated Cell Nuclei. V. G. Allfrey, A. E. Mirsky, and Syozo Osawa. *Journal of General Physiology*, v. 40, Jan. 1957, p. 451-490.

Amino acid incorporation into the proteins of isolated nuclei; role of deoxyribonucleic acid; effects of various inhibitors; nucleic acid synthesis.

6470* Mononucleotides of the Cell Nucleus. Syozo Osawa, V. G. Allfrey, and A. E. Mirsky. *Journal of General Physiology*, v. 40, Jan. 1957, p. 491-513.

Quantitatively and qualitatively much the same complement of acid-soluble mononucleotides occurs in the nucleus as in the cytoplasm. Within the nucleus, these nucleotides can be phosphorylated to the energy-rich triphosphate form.

6471* The Effect of Ribonucleotides on Ranikhet Disease Virus With Special Reference to Adenylic Acid. O. P. Babbar and M. M. Dhar. *Journal of Scientific & Industrial Research*, v. 15, sec. C, Nov. 1956, p. 249-254.

A combination of adenylic acid with the virus leads to destruction of virulence.

6472* Vitamin B_{12}—Its Chemistry, Production & Assay. V. C. Vora. *Journal of Scientific & Industrial Research*, v. 15, sec. A, Dec. 1956, p. 552-561.

A review of existing literature on the subject with 157 references.

6473* Studies on a Riboflavin Excreting Yeast. III. Suitable Sources of Carbon & Nitrogen. K. K. Mitra. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Dec. 1956, p. 257-259.

Maximum yields of riboflavin were obtained when glucose, fructose, or sucrose was used as the sole source of carbon.

6474 Reactions of Protein With Cyanate. O. C. Forbes. *Manufacturing Chemist*, v. 28, Jan. 1957, p. 9-12.

Cyanate protects proteins from coagulation due to heat. This was correlated with its capacity to react reversibly with free amino groups of protein.

6475* Are Chloroplasts Semiconductors? William Arnold and Helen K. Sherwood. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 105-114.

Dried chloroplasts give glow curves very much like those made with crystals. Resistance of the chloroplasts varies with the temperature in the manner of a semiconductor.

6476* Studies on the Immunological Overlap Among Certain Arthropod-Borne Viruses. II. The Role of Serologic Relationships in Experimental Vaccination Procedures. Winston H. Price. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 115-121.

Evidence for the possibility of using in humans a live West Nile virus in combination with one injection of killed Japanese B encephalitis virus to protect against several related virulent viruses of the group B classification.

6477* The Organization and Duplication of Chromosomes as Revealed by Autoradiographic Studies Using Tritium-Labeled Thymidine. J. Herbert Taylor, Philip S. Woods, and Walter L. Hughes. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 122-128.

6478* Some Factors Influencing the Long-Wave Limit of Photosynthesis. Robert Emerson, Ruth Chalmers, and Carl Cederstrand. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 133-143.

6479 Colominic Acid, a Substance of Bacterial Origin Related to Sialic Acid. Guy T. Barry and Walther F. Goebel. *Nature*, v. 179, Jan. 26, 1957, p. 206.

Preparation from *E. coli* K-235; characteristics.

6480* The Influence of Oxygen on the Mutagenic Effects of X-Rays on Maize Endosperm Loci. Calvin F. Konzak. *Radiation Research*, v. 6, Jan. 1957, p. 1-10.

6481* State of Tissue Acetylcholinesterase as Determined by Cobalt-60 Gamma Radiation Inactivation. Irving Serlin and George C. Cotzias. *Radiation Research*, v. 6, Jan. 1957, p. 55-66.

Irradiation of the electric eel organ, a tissue of very high water content, yielded a low rate of acetylcholinesterase inactivation which was unaffected by the removal of lyophilizable water.

6482 Time Factors in Protein Biosynthesis. C. E. Dalgliesh. *Science*, v. 125, Feb. 15, 1957, p. 271-273.

See also: **6368** (soil microorganisms); **6556** (vitamin A_2 isomers); **6560** (amino acid handbook); **6561** (determination of vitamin D); **6591** (chromatography of amino acids); **6593** (microorganisms for bioassay); **6680** (steroids); **6920** (preparation of aminoguanidine); **7113** (growth of staphylococci); **7733** (fungi in sewage).

CERAMICS AND CONCRETE

6483 Properties of Low-Temperature Solder Glasses. John Gallup and A. G. F. Dingwall. *American Ceramic Society Bulletin*, v. 36, Feb. 1957, p. 47-51.

Determinations of viscosity, thermal expansion, density, and index of refraction are reported for lead borosilicate glasses containing more than 70% PbO.

6484 High Temperature Reactions in Kaolin Type Clays. Richard R. West. *American Ceramic Society Bulletin*, v. 36, Feb. 1957, p. 55-58.

The compound in kaolin-type clays which melts at 1390 C and remains liquid until it volatizes or oxidizes below 1650 C is identified as SiO.

6485 Studies in the System (Ba, Ca, Pb) TiO_3. Malcolm McQuarrie. *American Ceramic Society, Journal*, v. 40, Feb. 1957, p. 35-41.

Weight loss, dye absorption, crystalline phase or phases, dielectric constant, dissipation factor, and temperature variation of dielectric constant were determined for various bodies fired in an air atmosphere at temperatures from 800 to 1400 C.

6486 Verification of Use of Peak Area for Quantitative Differential Thermal Analysis. G. de Josselin de Jong. *American Ceramic Society, Journal*, v. 40, Feb. 1957, p. 42-49.

Sensitivity of the method is discussed in relation to possible variations in density and heat conductivity of the sample and heat transfer through the thermocouple.

6487 Mathematical Treatment of Multicomponent Systems. D. L. Heath. *American Ceramic Society, Journal*, v. 40, Feb. 1957, p. 50-53.

6488 Glass Formation. A. Winter. *American Ceramic Society, Journal*, v. 40, Feb. 1957, p. 54-58.

Only the elements of group VI are known to form monatomic glasses, and they retain the ability to form a vitreous network when mixed or chemically bound to each other. They also form binary glasses with the elements of groups III, IV, and V.

6489 Properties of Thorium Oxide Ceramics. C. E. Curtis and J. R. Johnson. *American Ceramic Society, Journal*, v. 40, Feb. 1957, p. 63-68.

Strength, density, and porosity of thoria ceramics formed by dry pressing and isostatic pressing and fired at 1400, 1600, and 1800 C.

6490* Shrinkage and Temperature Stresses in Masonry. R. E. Copeland. *American Concrete Institute, Journal*, v. 28, Feb. 1957, p. 769-780; *ACI Proceedings*, v. 53, 1957, p. 769-780.

A theory for determining the maximum permissible distance between control joints in blank walls containing no "stress raisers". Effect of variables such as type and degree of restraint and properties of the masonry units.

6491* Plastic Shrinkage. William Lerch. *American Concrete Institute, Journal*, v. 28, Feb. 1957, p. 797-802; *ACI Proceedings*, v. 53, 1957, p. 797-802.

Causes of plastic shrinkage and cracking in fresh concrete; rate of evaporation; corrective measures.

6492 Determination of the Elastic Constants of Refractories by a Dynamic Method. J. R. Lakin. *British Ceramic Society, Transactions*, v. 56, Jan. 1957, p. 1-7.

Involves the determination of the resonant frequency of a regular specimen vibrating longitudinally, torsionally, or flexurally.

6493 Determination of the Modulus of Elasticity of Refractories at High Temperatures. J. R. Lakin and C. S. West. *British Ceramic Society, Transactions*, v. 56, Jan. 1957, p. 8-13.

Some results are given for silica and basic bricks.

6494 The Relation Between Modulus of Elasticity and Abrasion Resistance in Refractory Materials. C. Storey and J. Mackenzie. *British Ceramic Society, Transactions*, v. 56, Jan. 1957, p. 14-21.

6495* (French.) A Contribution to the Study of Thermal Impact on Ceramic Materials. **Contribution à l'étude des chocs thermiques sur les matériaux céramiques.** G. Méker. *Chaleur & Industrie*, v. 38, Jan. 1957, p. 3-6.

A simple method which, in a few cycles, determines the qualities and defects of a refractory. Production was improved.

6496 The Chemistry of Cement and Concrete. F. M. Lea and C. H. Desch. 2nd Ed. (Revised by F. M. Lea.) 637 p. 1956. Edward Arnold, Ltd., London. (TA434 L46c2)

Constitution and properties of cements; hydration, testing, and hardening; pozzolanic and special cements; behavior of concrete in use.

6497* (Russian.) The Production and Properties of Single Crystals of Solid Solutions of Barium Titanate and Lead Titanate and of Single Crystals of Lead Titanate. **Poluchenie i svoistva monokristallov tverdykh rastvorov titanatov bariia i svintsa.** M. L. Sholokhovich, E. G. Fesenko, O. P. Kramarov, and A. L. Khodakov. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 11, 1956, p. 1025-1028.

Description of method of growing single crystals which can be used for transistor devices. Electrical and physical properties of the crystals.

6498 Further Experiments on the Sintering of Zinc Oxide. J. Hutchings and J. P. Roberts. 28 p. 1956. Ministry of Supply, London. (TN695 H97f Over.)

The sintering of zinc oxide powder pressings in mixtures of oxygen and argon was influenced markedly by the proportions of two gases present. Oxygen was identified as the gas component affecting the sintering.

6499 Georgia Kaolin Handbook. Sections individually paged. Georgia Kaolin Co., Elizabeth, N. J. (TN941 G29g Over.)

A loose-leaf collection of bulletins with useful information about (kaolin) the mineral, its technology and use.

6500 A Survey of the Effect of Composition on the Internal Friction of Glass. L. C. Hoffman and W. A. Weyl. *Glass Industry*, v. 38, Feb. 1957, p. 81-85, 104.

Internal friction peaks at high temperatures are probably best explained by the presence of oscillating volume elements of greater size than ions, lending support to the hypotheses of a discontinuous structure for glass.

6501* (English.) **Influence of High Temperature of Mixing Water on Setting, Consistency, Strength, and Heat of Concrete.** Hideo Yokomichi. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1956, p. 89-101.

Temperatures as high as 80 C had no bad effects and some good ones.

6502* (French.) The "Pinks" in Ceramics. **Les "pinks" en ceramique.** *Industrie Céramique*, no. 482, Jan. 1957, p. 1-5.

The influence of the various components of "pink" used in preparing enamels, the glaze, and other essential factors such as the nature of the Cr salts baking temperature, and frit quality.

6503* (French.) Talc Pastes That Can be Vitrified at Average Temperature. **Pâtes au talc vitrifiables à moyenne température.** R. Royer. *Industrie Céramique*, no. 482, Jan. 1957, p. 6-12.

A study of compositions based on feldspar and talc, and possessing a sufficient baking capacity, in relation to their possible vitrification between 1150 and 1250 C. The silica content should be as low as possible.

6504 Protection of Refractories by Moving Air Curtains. J. H. Chesters, C. Holden, and A. D. Robertson. *Iron and Steel Institute, Journal*, v. 185, Feb. 1957, p. 177-200.

Tests suggest that relatively slow moving air curtains in open-hearth furnaces emerging from an essentially continuous slot afford sufficient protection to the refractories to warrant their trial in areas where excessive wear is normally experienced.

6505* Study of Some Factors in the Production of Carbon-Bonded Graphite Crucibles. T. V. Prasad, H. P. S. Murthy, and Rabindar Singh. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Nov. 1956, p. 645-650.

Influence of graphite-silicon carbide ratio; effect of varying proportion of fireclay grog; conditions for binder carbonization. Two suitable body compositions are suggested.

6506* (English.) **On the Combustion and Heat Transmission in a Glass Tank Furnace.** Ikutaro Sawai and Masanaga Kunugi. *Kyoto University, Institute for Chemical Research, Bulletin*, v. 34, May 1956, p. 142-164.

Length of gas and oil flames; distribution of flame temperature; influence of convection current and glass composition on temperature distribution in molten glass.

6507 Lead in the Ceramic Industries. Sections individually paged. Lead Industries Assn., New York. (TP245.L4 L46L Over.)

A loose-leaf manual intended as a permanent record of the properties and applications of Pb compounds that may be helpful to the ceramist. Includes phase diagrams.

6508 (English.) **The Electric Strengths of Glasses With Different Sodium Contents.** J. Vermeer. *Physica*, v. 22, Dec. 1956, p. 1247-1253.

The values of the intrinsic electric strength ranged from 9 MV/cm. to 11.5 MV/cm. between −183 and +200 C.

6509 (English.) **The Electrical Conduction of Glass at High Field Strengths.** J. Vermeer. *Physica*, v. 22, Dec. 1956, p. 1257-1268.

6510 Thermodynamic Theory of Ferroelectric Ceramics. H. G. Baerwald. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 480-486.

Development of a thermodynamic continuum theory which is based on the postulated isomorphism, relevant to small signals only, between a polarized ceramic and one under bias fields near the limit of its nonpolar state.

6511 Total Neutron Scattering in Vitreous Silica. R. J. Breen, R. M. Delaney, P. J. Persiani, and A. H. Weber. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 517-521.

The structure of Corning superpure vitreous silica glass was investigated with neutrons.

6512 Resistance of Concrete to Frost at Early Ages. T. C. Powers. *Portland Cement Association Research Department Bulletin* 71, Oct. 1956, 47 p. (TP883 P83b Vis.)

Review of theories pertaining to frost action in building materials. Application of the theory of frost heaving in soils to freezing in concrete.

6513* Some Aspects of Ceramics in Atomic Energy. P. Murray. *Refractories Journal*, v. 33, Jan. 1957, p. 2-10.

Emphasizes potential use of the refractory compounds of Th and V as fuel element materials in place of the respective metals.

6514* (French.) A New Refractory Material: "Chromal". **Un nouveau matériau réfractaire: le chromal.** A. Hivert and S. Tacvorian. *Revue de Métallurgie*, v. 54, Jan. 1957, p. 57-64.

Studies of alumina-chromium composites including sintering under pressure, influence of various protective atmospheres, and influence of carbon.

6515* Here's a New Way to Make Cool Cement. C. F. Clausen. *Rock Products*, v. 60, Feb. 1957, p. 104 + 6 pages.

Temperature inside grinding mills is controlled by continuously withdrawing a part of the grinding media, cooling them by means of air, immersion in a coolant, and evaporation, and returning such cooled grinding media to the mill.

6516* In Lime Putty Mixes Water-Lime Factor Determines Strength. Nissan Zalmanoff. *Rock Products*, v. 60, Feb. 1957, p. 122-123, 125, 128.

Aggregates exert primary influence on mechanical strength of the final product.

6517* (German.) The Electrical Load of High-Tension Porcelain With Regard to Pores in the Insulating Material. **Die Elektrische Beanspruchung von Hochspannungsporzellan unter Berücksichtigung der Poren im Isolierstoff.** G. Morgenstern. *Silikattechnik*, v. 8, Jan. 1957, p. 7-10, 23.

Dielectric boundary surface effects at the cavity boundaries of porous porcelain insulating materials in the case of high-tension.

6518* (German.) High-Temperature Enamels. **Hochtemperaturemails.** H. Betzer. *Silikattechnik*, v. 8, Jan. 1957, p. 20-22.

A short account of enameling techniques.

6519 Synthetic Asbestos Investigations. III. Synthesis and Properties of Fibrous Potassium-Lead Silicate. H. R. Shell, R. A. Hatch, and D. L. Brown. *U. S. Bureau of Mines, Report of Investigations* 5293, Jan. 1957, 20 p. (TN21 Un3r)

See also: **6559** (differential thermal analysis); **6650** (perovskite-type compounds); **6810** (silver films on glass); **6910** (Na-Pb niobate ceramics); **7336** (magnesite-chrome brick furnace roofs); **7346** (basic open-hearth refractories); **7351** (ladle and casting pit refractories); **7353** (repair of open-hearth refractories).

CHEMICAL ENGINEERING

6520 The Measurement of Lather Quickness. Paul Becher and Russell E. Compa. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 53-57.

Apparatus and technique of method capable of distinguishing differences in lather quickness as a function of soap stock composition, presence of additives, hardness, and temperature.

6521 Pilot Plant Development of the Alkali Cooking Process for Cottonseed Meats. II. Effect of Additional Comminution. Nestor B. Knoepfler, W. H. King, M. F. Stansbury, and E. J. McCourtney. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 61-66.

Effects of grinding at moisture contents from 12 to 31%, rolling and re-rolling at various moisture levels from 4 to 13%, and rolling at temperatures from 90 to 150 F.

6522* Diatomite Filters for Municipal Installations. E. Robert Baumann. *American Water Works Association, Journal*, v. 49, Feb. 1957, p. 174-186.

Survey shows successful, economical performance despite a 21 state disapproval.

6523* Taste and Odor Control at Philadelphia. Elwood L. Bean. *American Water Works Association, Journal*, v. 49, Feb. 1957, p. 205-216.

Treatment of raw water from the Schuylkill and the Delaware rivers, both of which are polluted by wastes.

6524* (Dutch.) A New Liquid Filtration Method. **Een nieuwe methode voor de filtratie van vloeistoffen.** L. C. H. van den Berg. *Bedrijf en Techniek*, v. 12, Jan. 26, 1957, p. 46-48.

Advantages and practical applications of an upflow filtration method.

6525* Estimation of H. E. T. P. Values for Binary Distillation Columns. W. H. Granville. *British Chemical Engineering*, v. 2, Feb. 1957, p. 70-74.

A correlation for estimating "height equivalent to a theoretical plate" values for Raschig rings at the loading velocity.

6526 Gas-Liquid Contacting in Random-Packed Towers. Flow Through Packings and Beds. Max Leva. *Chemical Engineering*, v. 64, Mar. 1957, p. 261-265.

Empirical methods enabling determination of pressure drop, flooding, liquid holdup, and loading.

6527 Predict Thermal Conductivity. II. How to Estimate Engineering Properties. Wallace R. Gambill. *Chemical Engineering*, v. 64, Mar. 1957, p. 271-276.

Methods of estimating values for pure liquids, mixtures, solids, and solid-gas mixtures.

6528* Filtration. H. K. Suttle. *Chemical & Process Engineering*, v. 38, Feb. 1957, p. 59-62.

Theoretical and practical advances; atmospheric pollution problems; filter media; filters in unit processes; filtration by sound waves.

6529 Ammonia Synthesis Gas by Low Temperature Separation. J. T. Hugill. *Chemistry in Canada*, v. 9, Feb. 1957, p. 25-32.

Flow diagrams; types of air plants; nitrogen scrubbing units; safety precautions.

6530 Silver in Chemical Plant Construction. J. M. Pirie. *Corrosion Technology*, v. 4, Feb. 1957, p. 45-48.

Chemical and mechanical properties; resistance to chemical attack in various media. Silver is largely used with aqueous HCl and with halogens.

6531* (Japanese.) **Studies on Separation of Raw Materials From Sea Water. I. Pilot-Plant Test for the Separation of Mg^{++} and Ca^{++}, and the Autovapor Evaporation.** Kenji Tanaka, Hiromi Nishida, Seiichi Ishizaka, Koichi Tawara, Takeshi Tohoyama, Hiroaki Matsuda, Matsuo Terada, Shigeo Iwata, Kenzaburo Obata, Keiji Ohyama, Kazuo Sato, and Yoshiro Wada. *Government Chemical Industrial Research Institute, Tokyo, Reports*, v. 51, Dec. 1956, p. 437-497.

Energy required to evaporate the pretreated sea water is presumed as 20 kw.-hr. per ton of water on the average, when a large plant with three stages of autovapor evaporators installed in series is constructed.

6532 The "Shell" Hydrodesulphurization Process. G. R. Storey. *Institute of Petroleum Review*, v. 11, Feb. 1957, p. 35-39.

Liquid product yields are greater than 100%. "Trickle phase" technique means that higher boiling distillates can be desulfurized without the high recycle gas rates which would be necessary for a vapor-phase process.

6533 Fertilizer Manufacture — Fertilizer by Fusion of Phosphate Rock and Gypsum. D. R. Boylan and M. A. Larson. *Journal of Agricultural and Food Chemistry*, v. 5, Feb. 1957, p. 104-108.

Product is granular, nonhygroscopic, and easily ground. Process appears to have definite economic advantages for certain areas and is especially suited to Iowa, where large deposits of gypsum are available.

6534* The Making of Free-Flowing Table Salt. G. I. Finch. *Journal of Scientific & Industrial Research*, v. 15, sec. A, Dec. 1956, p. 539-542.

This problem is used as an example for the scientific approach to simple technical problems.

6535* (Russian.) Indirect Method of Determining the Relative Activity of Catalysts. **O kosvennykh sposobakh opredeleniia otnositel'noi aktivnosti katalizatorov.** N. V. Goncharova, A. A. Voitekhov, V. I. Karzhev, and D. I. Orochko. *Khimiia i Tekhnologiia Topliva*, no. 1, Jan. 1957, p. 3-13.

Method and experimental data for evaluation of catalyst activity working under 300 atm. in hydrogenation processes.

6536* Automatic Proportioning. *Mechanical Handling*, v. 44, Feb. 1957, p. 70-73.

Demonstration of a system for the automatic weigh-batching of ingredients.

6537 Today and Tomorrow in Process Automation. G. L. Farrar. *Oil and Gas Journal*, v. 55, Feb. 18, 1957, p. 121-136.

A process flowsheet; parts of the automatic control system and how they work; process stream analyzers; automatic data logging systems; electronic computers and their applications.

6538 Polymerisation of Light Hydrocarbons. I. Recent Progress in Refinery Processes. P. W. Sherwood. *Petroleum*, v. 20, Feb. 1957, p. 56-58.

The place of polymerization in the production schedule and some of the techniques used.

6539 Low-Finned Exchanger Tubing. I. Extended Surface Characteristics and Calculations. Robert G. Newell. *Petroleum Processing*, v. 12, Feb. 1957, p. 71-77.

Heat transfer coefficients and other basic information for equipment design. (To be continued.)

6540 How to Design Perforated Trays. I. Leibson, R. E. Kelley, and L. A. Bullington. *Petroleum Refiner*, v. 36, Feb. 1957, p. 127-133.

A new method, new correlations, and detailed example calculations.

6541 Cooling Water Treatment—A Review. Maxey Brooke. *Petroleum Refiner*, v. 36, Feb. 1957, p. 142-148.

Reviews use in a plant and suggests methods of treatment.

6542 Polar Diagrams Speed Cooler-Condenser Design. G. H. P. Bras. *Petroleum Refiner*, v. 36, Feb. 1957, p. 149-154.

A graphical method with a polar diagram for use in determining gas-liquid interface conditions.

6543* How to Keep Filter and Sodium Zeolite Systems Operating Efficiently. R. E. Hinich. *Plant*, v. 15, Feb. 1957, p. 55-57.

Some practical tips for proper operation of pressure filtering systems and zeolite water softening equipment.

6544* Removing Color From Industrial Process Water. Eskel Nordell. *Power*, v. 101, Mar. 1957, p. 102-105.

Coagulation, settling, and filtration will generally remove or reduce color to specified tolerances.

6545* (Polish.) Dependence of Rate of Crystallization on Chemical Composition of Brine. **Zależność szybkości krystalizacji solanki od jej składu chemicznego.** Z. Czerwiński and B. Ryński. *Przemysł Chemiczny*, v. 12, Dec. 1956, p. 678-682.

The presence of impurities exerts an important influence on the rate of crystallization of artificial brines.

6546* (Polish.) Investigation of Synthesizing Naphthalene-1-Sulfinic-7-Sulfonic Acid and Naphthalene-1,7-Disulfonic Acid. **Badania nad otrzymywaniem kwasu naftaleno-1-sulfino-7-sulfonowego oraz kwasu 1,7-naftaleno-dwusulfonowego.** Wł. Lisowski. *Przemysł Chemiczny*, v. 12, Dec. 1956, p. 697-700.

A pilot plant method of synthesis.

6547* Chlorine Dioxide Generation. W. Wiesner. *Pulp and Paper Magazine of Canada*, v. 58, Feb. 1957, p. 83-88.

Review eight systems; describes the Holst batch system.

6548 Reports on the Progress of Applied Chemistry. v. XL. 1000 p. 1955. Society of Chemical Industry, London. (TP1 So13r Vis.)

Literature reviews on various phases of organic and inorganic chemistry, fuel and fuel products, metals, biological products, textiles, plastics, paints, chemical hazards, and food and agriculture.

6549 Fresh Water From Salt. David S. Jenkins. *Scientific American*, v. 196, Mar. 1957, p. 37-45.

Brief descriptions of the various types of salt-water conversion methods currently under investigation.

6550* Unprotected Glass Aerosols. Jack Pickthall. *Soap, Perfumery and Cosmetics*, v. 30, Feb. 1957, p. 171-180.

Experiments suggest that uncoated glass aerosol bottles are potentially dangerous.

6551* Production of Chlorine Dioxide at New High Efficiency. W. W. Northgraves, B. H. Nicolaisen, T. H. Dexter, and D. J. Jaszka. *Southern Pulp and Paper Manufacturer*, v. 20, Feb. 1957, p. 70, 72, 74-75.

The efficiency of processes using $NaClO_3$ and a reducing agent in a H_2SO_4 medium is improved by addition of NaCl to the reaction system.

6552 Unit Operations of Chemical Engineering. Warren L. McCabe and Julian C. Smith. 945 p. 1956. McGraw-Hill, New York. (TP155 M12u)

An undergraduate text in which each unit operation is treated separately. General discussions cover fluid mechanics, flow of heat, and mass transfer.

6553 Flash Evaporator for Distillation of Sea Water. R. L. Coit and Y. S. Touloukian. *Westinghouse Engineer*, v. 7, Mar. 1957, p. 58-60.

A simple device which provides an economical means of producing potable water from sea or polluted water sources when a low cost source of heat is available.

6554* New Process Heater Design. Ralph Morrow. *World Petroleum*, v. 28, Feb. 1957, p. 34-37.

Double firing of vertically suspended tube banks is featured in new heater design where tubes remain straight at high temperatures.

6555* Catalytic Reforming and Dehydrogenation. Heinz Heinemann and Harold Shalit. *World Petroleum*, v. 28, Feb. 1957, p. 56, 58, 60, 62.

A review of recent United States Patents.

See also: **6375** (fertilizer manufacture); **6515** (cooling of grinding media); **7094** (valves for blending operations); **7137** (hydrogenation of crude oil); **7222** (steam condensation promoters); **7223** (hydrazine in boiler feedwater); **7535** (high-temperature coolants).

CHEMISTRY—ANALYTICAL

6556* (English.) **Chromatographic Separation of Two Vitamin A_2 Isomers.** B. Barnholdt and Willy Hjarde. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1635-1648.

The presence of two vitamin A_2 isomers in perch and pike liver extract is demonstrated, and spectroscopic properties given.

6557* (English.) **A Contribution to the Theory of Chromatography.** Tage Langvad. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1649-1662.

For the general case in which the adsorption isotherm is nonlinear and the flow rate is too great to obtain equilibrium, a solution is found in which the problem of normal distribution is converted into an investigation of a linear dependency.

6558 A Thermal-Gradient Quenching Furnace for Preparation of Fused Salt Samples for Phase Analysis. P. A. Tucker and E. F. Joy. *American Ceramic Society Bulletin*, v. 36, Feb. 1957, p. 52-54.

In a single quenching operation, a sample of known composition can be studied over a wide temperature range.

6559 A New Method of Differential Thermal Analysis Employing Multiple Thermocouples. William Lodding and Edward Sturm. *American Mineralogist*, v. 42, Jan.-Feb. 1957, p. 78-82.

6560 Amino Acid Handbook. Methods and Results of Protein Analysis. Richard J. Block and Kathryn W. Weiss. 386 p. 1956. Charles C. Thomas, Springfield, Ill. (QD431 B62ah)

Detailed directions for analysis by microorganisms, column chromatography, and paper chromatography. Tabulation of the amino acid composition of proteins, biologically active polypeptides, and foods.

6561* The Determination of Vitamin D and Related Compounds. I. Introduction and Preparation of Compounds in the Irradiation Series. W. H. C. Shaw, J. P. Jefferies, and T. E. Holt. **II. Analysis of Irradiation Products.** W. H. C. Shaw and J. P. Jefferies. *Analyst*, v. 82, Jan. 1957, p. 2-18.

Compounds formed on irradiation may be separated into groups by preliminary chromatography on activated alumina and individual compounds then determined by ultra-violet spectroscopy and application of the $SbCl_3$ color reaction.

6562* The Determination of Traces of Boron in Nickel. R. C. Chirnside, H. J. Cluley, and P. M. C. Proffitt. *Analyst*, v. 82, Jan. 1957, p. 18-24.

An electrolytic procedure.

6563* Volumetric Determination of Cyanide and Nickel With Resacetophenone Oxime as an Indicator. K. S. Bhatki. *Analyst*, v. 82, Jan. 1957, p. 24-26.

6564* The Determination of Mercury in Air. G. A. Sergeant, B. E. Dixon, and R. G. Lidzey. *Analyst*, v. 82, Jan. 1957, p. 27-33.

Mercury vapor is taken up by iodized active C, and Hg-bearing dust is trapped in a mineral wool filter. On heating, the Hg is transferred as vapor to a Se sulfide test paper giving a typical stain.

6565* The Use of Zincon in the Absorptiometric Determination of Mercury. A. G. Morris. *Analyst*, v. 82, Jan. 1957, p. 34-37.

Procedure covers a working range of about 3 to 8 p.p.m. of mercuric Hg.

6566* Organo-Tin-Dithizone Complexes. The Colorimetric Determination of Diethyltin and Triethyltin Compounds. W. N. Aldridge and Jill E. Cremer. *Analyst*, v. 82, Jan. 1957, p. 37-43.

6567* The Polarographic Determination of Tin in Hydrogen Peroxide After Use of a Cation-Exchange Resin. G. F. Reynolds. *Analyst*, v. 82, Jan. 1957, p. 46-50.

6568* Developments in the Micro Vacuum Fusion Method, With Particular Reference to the Determination of Oxygen, Nitrogen and Hydrogen in Beryllium, Titanium, Zirconium, Thorium and Uranium. E. Booth, F. J. Bryant, and A. Parker. *Analyst*, v. 82, Jan. 1957, p. 50-61.

6569* A Rapid Photometric Procedure for the Determination of Thiamine With 6-Aminothymol. K. J. Hayden. *Analyst*, v. 82, Jan. 1957, p. 61-66.

6570* (English.) **Separations Involving Sulphides. II. Separation of Arsenic, Molybdenum and Tellurium From Mercury.** G. B. S. Salaria. *Analytica Chimica Acta*, v. 16, Jan. 1957, p. 3-5.

Method involves decomposing, in one portion, a thiosalt of Hg alone with ammonium acetate, and in another portion the thiosalts of both metals with HCl.

6571* (English.) **Determination and Separation of Copper in Metallurgical Products.** E. C. Stathis. *Analytica Chimica Acta*, v. 16, Jan. 1957, p. 21-24.

Cupric ions are reduced in HNO_3 solution by ascorbic acid.

6572* (English.) **Separation of Uranium From Vanadium by Ion Exchange: With Special Reference to the Determination of Small Amounts of Uranium.** T. K. S. Murthy. *Analytica Chimica Acta*, v. 16, Jan. 1957, p. 25-28.

6573* (French.) Colorimetric Determination of Uranium With Dibenzolymethane. **Dosage colorimétrique de l'uranium par le dibenzoylmethane.** P. Blanquet. *Analytica Chimica Acta*, v. 16, Jan. 1957, p. 44-56.

A complex is formed in aqueous pyridine in the presence of EDTA and tartaric acid; the optical density is measured at 415 mμ.

6574* (English.) **Direct Spectrophotometric Determination of Thorium With SPADNS.** Gurupada Banerjee. *Analytica Chimica Acta*, v. 16, Jan. 1957, p. 56-61.

Quantities as small as 0.04 γ of Th can be estimated. SPADNS is 2-*p*-sulphophenylazo - 1,8 - dihydroxynaphthalene - 3,6 - disulphonic acid.

6575* (English.) **Direct Spectrophotometric Determination of Zirconium With SPADNS.** Gurupada Banerjee. *Analytica Chimica Acta*, v. 16, Jan. 1957, p. 62-66.

6576* (English.) **The Determination of Uranium in Alloy Systems.** G. W. C. Milner and J. W. Edwards. *Analytica Chimica Acta*, v. 16, Feb. 1957, p. 109-114.

Procedure suitable for analysis of Bi-U alloys up to 20% U.

6577* (English.) **Inorganic Analysis in Organic Solvents. II. 8-Hydroxyquinaldine as a Reagent for the Determination of Copper.** A. J. Blair and D. A. Pantony. *Analytica Chimica Acta*, v. 16, Feb. 1957, p. 121-128.

The optical density of the chromatographed eluate is measured at 400 mμ. with respect to the solvent.

6578* (English.) **The Polarographic Determination of Aluminium in Zinc-Base Die-Casting Alloys.** J. A. Page, D. H. Simpson, and R. P. Graham. *Analytica Chimica Acta*, v. 16, Feb. 1957, p. 194-200.

Interfering elements are removed by electrolysis of a solution of the alloy in a Hg-cathode cell.

6579 Application of Gas-Liquid Chromatography to Analysis of Liquid Petroleum Fractions. D. H. Desty and B. H. F. Whyman. *Analytical Chemistry*, v. 29, Mar. 1957, p. 320-329.

Gas density balance apparatus was used to determine the retention volumes of a large number of hydrocarbons and some sulfur compounds boiling in the range from 30 to 150 C, using stationary phase liquids of differing structural type.

6580 Characterization of Long-Chain Fatty Acids by Infra-Red Spectroscopy. Rudd A. Meiklejohn, Robert J. Meyer, Sanford M. Aronovic, Henry A. Schuette, and Villiers W. Meloch. *Analytical Chemistry*, v. 29, Mar. 1957, p. 329-334.

Infra-red spectra of synthetic solid fatty acids of exceptionally high purity from C_{10} to C_{36} are presented, as well as the band progressions for soaps from C_2 to C_{36}.

6581 Infrared Absorption of Aldehydic C-H Group. Ortho-Substituted Benzaldehydes. Shraga Pinchas. *Analytical Chemistry*, v. 29, Mar. 1957, p. 334-339.

Increase in C-H frequencies is caused by a H bond affecting the aldehydic C-H group.

6582 Quantitative Infrared Analyses of Mixtures of Isomeric or Closely Related Substances. Mixtures of Chlorinated Insecticides. I. R. C. McDonald and C. C. Watson. *Analytical Chemistry*, v. 29, Mar. 1957, p. 339-346.

Methods for determining the active pesticide content of commercial BHC, lindane, DDT, TDE, and Ovex.

6583 X-Ray Absorption Edge Spectrometry as an Analytical Tool. Determination of Molybdenum and Zinc. Robert E. Barieau. *Analytical Chemistry*, v. 29, Mar. 1957, p. 348-352.

6584 Extrapolation Plot for Photometric Titration of Weak Bases in Aqueous and Nonaqueous Systems. Carl Rehm and Takeru Higuchi. *Analytical Chemistry*, v. 29, Mar. 1957, p. 367-369.

6585 Determination of Protactinium by Gamma Spectrometry. Murrell L. Salutsky, Mary Lou Curtis, Kenneth Shaver, Andrew Elmlinger, and Robert A. Miller. *Analytical Chemistry*, v. 29, Mar. 1957, p. 373-375.

Gamma spectrometry was used to determine Pa in concentrations of less than 1 p.p.m. in U residues.

6586 Esso Lamp Method for Sulfur. C. C. Hale, E. R. Quiram, J. E. McDaniel, and R. F. Stringer. *Analytical Chemistry*, v. 29, Mar. 1957, p. 383-388.

An integrated and rapid lamp method for determination of total S in petroleum was developed and cooperatively tested. Modified finishing methods include conductometric for nonleaded samples, nephelometric for leaded or nonleaded samples in the range of 1 p.p.m. to 0.06%, and a gravimetric method which avoids the conventional digestion and ignition steps.

6587 Remote Control Determination of Corrosion Products and Additives in Homogeneous Reactor Fuel. Application of Ion Exchange. A. D. Horton, P. F. Thomason, and M. T. Kelley. *Analytical Chemistry*, v. 29, Mar. 1957, p. 388-391.

Adsorption characteristics of the corrosion products with respect to anion and cation exchange resins, and procedure outlines for determination of Al, Ni, Co, Cr, Fe, Mn, Cu, and Zr.

6588 Use of Ion Exchange Resins for Determination of Uranium in Ores and Solutions. Sallie Fisher and Robert Kunin. *Analytical Chemistry*, v. 29, Mar. 1957, p. 400-402.

6589 Use of Thymol-Sulfuric Acid Reaction for Determination of Carbohydrates in Biological Material. M. R. Shetlar and Yanna F. Masters. *Analytical Chemistry*, v. 29, Mar. 1957, p. 402-405.

6590 Estimating Total Absolute Activity of Small Radioactive Precipitates on Filter Paper. Paul T. Wagner, Louis R. Pollack, and Clarence G. Donahoe, Jr. *Analytical Chemistry*, v. 29, Mar. 1957, p. 405-408.

Proposed method allows estimation of the total activity of precipitates on filter paper from the measured activities of both sides of the paper.

6591 Microdesalter for Qualitative Paper Chromatography of Amino Acids. Gunter Zweig and S. L. Hood. *Analytical Chemistry*, v. 29, Mar. 1957, p. 438-441.

Microdesalter removes interfering inorganic ions from biological samples spotted on filter paper. Advantages of this technique are the speed of operation and the small size of the sample required for desalting.

6592 Rapid Routine Method for Determination of Uranium in Ores. H. J. Seim, R. J. Morris, and D. W. Frew. *Analytical Chemistry*, v. 29, Mar. 1957, p. 443-446.

Uranium is separated from all commonly occurring interfering ions by adsorption on an anion exchange resin. After elution with perchloric acid, the U is determined colorimetrically by the $NaOH-H_2O_2$ method.

6593* Analytical Microbiology. I. The Test Organism. John J. Gavin. *Applied Microbiology*, v. 4, Nov. 1956, p. 323-331.

Requirements for an ideal test organism; types of microbial response; types of microorganisms used for assay; factors involved in analytical procedures.

6594* Electrochromatography of Boron. William H. Hill, Jean M. Merrill, and Betty J. Palm. *Archives of Industrial Health*, v. 15, Feb. 1957, p. 152-159.

Method for determining trace quantities is based on the migration of the borate ion to the anode of an electric field and its visualization as the red boron-turmeric complex, which is developed on the paper strip after ionophoresis.

6595* A Modified Method for the Quantitative Estimation of Diphenyl in Citrus Fruits. W. L. Stanley, S. H. Vannier, and B. Gentili. *Association of Official Agricultural Chemists, Journal*, v. 40, Feb. 1957, p. 282-286.

An estimation of diphenyl by modification of the chromatostrip-spectral method.

6596* Infrared Spectrophotometric Determination of DDT and Gamma Benzene Hexachloride in Cotton Dusts. H. C. Austin, Jr., Frances L. Bonner, and E. A. Epps, Jr. *Association of Official Agricultural Chemists, Journal*, v. 40, Feb. 1957, p. 286-293.

Uses a baseline density technique with compensations for interferences for quantitative analysis.

6597* Separation and Identification of Chlorinated Organic Pesticides by Paper Chromatography. X. The Sensitivity of the Chromogenic Agent for the Detection of Pesticides in the Chromatogram. Lloyd C. Mitchell. *Association of Official Agricultural Chemists, Journal*, v. 40, Feb. 1957, p. 294-302.

6598* Bibliographical Abstracts of Methods for Analysis of Synthetic Detergents, 1888-1956. Jay C. Harris and Rubin Bernstein. 39 p. 1956. American Society for Testing Materials, Philadelphia. (ZTP991 Am35ba)

6599* (French.) Spectrophotometric Determination of Gallium in the Presence of Aluminon. **Dosage due gallium par spectrophotometrie en présence d'aluminon.** Émile Rinck and Pierre Feschotte. *Bulletin de la Société Chimique de France*, no. 2, Feb. 1957, p. 230-234.

Very small quantities of Ga can be determined by aurin tricarboxylic acid or aluminon. The method used can be applied to Al. From 1 to 50 γ of Ga within $\pm$ 1γ was observed.

6600 Accurate X-Ray Fluorescence Analysis Without Internal Standard. Fernand Claisse. *Canadian Department of Mines, P. R. No.* 327, 1956, 24 p. (TN27 Q3.54p Contin.)

A fusion method of preparing ores, minerals, and other chemical compounds for analysis.

6601 The Basis of the Selectivity of Dimethylglyoxime as a Reagent in Gravimetric Analysis. A. G. Sharpe and D. B. Wakefield. *Chemical Society, Journal,* Jan. 1957, p. 281-285.

Decisive factors in determining relative solubilities are the metal-metal bonding in the Ni, Pd, and Pt complexes, and the fact that the phase in equilibrium with a saturated solution of the Co complex is a stable dihydrate.

6602 Applications of Infrared Spectroscopy. Some Applications of Infrared Spectroscopy to Carbohydrate Chemistry. D. H. Whiffen. *Chemistry & Industry,* no. 5, Feb. 2, 1957, p. 129-131.

Detection of sulfone groups, panose, and dextran. Determination of impurities in mannitol.

6603 Applications of Infrared Spectroscopy, Application of Infrared Continuous Analysers. H. H. Hausdorff. *Chemistry & Industry,* no. 6, Feb. 9, 1957, p. 154-158.

Types of instruments; typical industrial installations.

6604* (English.) **A Contribution to the Theory of Paper Chromatography of Inorganic Compounds. I. Alkali and Alkaline Earth Chlorides.** I. Vavruch and M. Hejtmánek. **II. Semiquantitative Microanalysis of Sodium and Potassium.** I. Vavruch, M. Hejtmánek, and J. Bouzková. *Collection of Czechoslovak Chemical Communications,* v. 21, Dec. 1956, p. 1363-1380.

6605* Bibliography of Publications Dealing With the Polarographic Method in 1954 and 1955. J. Heyrovský. *Collection of Czechoslovak Chemical Communications,* v. 20-21, Suppl. 1, 1955-1956, 61 and 76 p.

International annotated bibliography containing about 2,000 entries.

6606 Fusion Method for the Determination of Lead in Lubricating Oils. H. A. Ruffell and A. A. Cunning. *Commonwealth of Australia, Dept. of Supply, Defence Standards Laboratories Technical Note* 39, May 1956, 7 p. (Tl Au78.2tn Vis.)

The Pb is converted to sulfate by igniting the oil in the presence of excess potassium bisulfate. After removal of volatile and combustible constituents the residue is extracted with water and the Pb content determined gravimetrically or volumetrically as chromate.

6607 A Guide to Qualitative Organic Chemical Analysis. R. P. Linstead and B. C. L. Weedon. 169 p. 1956. Academic Press, New York.

6608* Circular Paper Chromatography. X. Separation, Identification and Quantitative Estimation of Riboflavin and Flavin Compounds. K. V. Giri and P. R. Krishnaswamy. *Indian Institute of Science, Journal,* v. 38, sec. A, Oct. 1956, p. 232-244 + 2 plates.

n-Butanol-acetic acid-water solvent was found to give the best resolution.

6609 The Determination of Mono- and Di-Aromatics in Mineral Oil Fractions. H. Geelen, H. I. Waterman, and J. B. Westerdijk. *Institute of Petroleum, Journal,* v. 43, Jan. 1957, p. 14-20.

Relation between specific refraction, mol. wt., and number of rings.

6610 Infrared Determination of Dichlorodiphenyltrichlorethane and Benzene Hexachloride in Insecticides. William B. Bunger and Rex W. Richburg. *Journal of Agricultural and Food Chemistry,* v. 5, Feb. 1957, p. 127-130.

6611 Determination of Carotene in Silages and Forages. H. G. Wiseman, H. M. Irvin, and L. A. Moore. *Journal of Agricultural and Food Chemistry,* v. 5, Feb. 1957, p. 134-137.

Chromatographic method combines the advantages of splash-free blending extraction afforded by alcohol-Skellysolve B foaming mixtures and the elimination of epiphasic washing to remove alcohol.

6612 Paper Chromatography of Polycyclic Aromatic Hydro-Carbons. Ernst D. Bergmann and Theodor Gruenwald. *Journal of Applied Chemistry,* v. 7, Jan. 1957, p. 15-24.

Systems studied were: anthracene and methylated anthracenes; fluorene and methylated fluorenes; phenanthrene, fluorene, and anthracene; mixtures of tricyclic and polycyclic hydrocarbons. Paper was either acetylated or impregnated with alumina, propylene glycol, Vaseline, or silicone.

6613 Gas-Liquid Chromatography in a Plastics Analytical Laboratory. J. Haslam and A. R. Jeffs. *Journal of Applied Chemistry,* v. 7, Jan. 1957, p. 24-32.

Particular attention is paid to the examination of monomers, depolymerization products obtained from polymers and adhesives.

6614 The Quantitative Measurement and Transfer of Samples in Gas Chromatography. S. W. S. McCreadie and A. F. Williams. *Journal of Applied Chemistry,* v. 7, Jan. 1957, p. 47-48.

Apparatus and procedure.

6615 The Use of Mass Spectrometry in Organic Analysis. Ernest L. Eliel, Thomas J. Prosser, and George W. Young. *Journal of Chemical Education,* v. 34, Feb. 1957, p. 72-77.

6616 The Mutual Separation of Thorium. Protoactinium, and Uranium by Tributyl Phosphate Extraction From Hydrochloric Acid. *Journal of Inorganic and Nuclear Chemistry,* v. 3, Jan. 1957, p. 370-378.

6617 The Separation of Carrier-Free Tellurium Tracers by Paper Chromatography. A. S. Ghosh Mazumdar and M. Lederer. *Journal of Inorganic and Nuclear Chemistry,* v. 3, Jan. 1957, p. 379-383.

6618 Separation of Thorium and Uranium Nitrates by Anion Exchange. D. J. Carswell. *Journal of Inorganic and Nuclear Chemistry,* v. 3, Jan. 1957, p. 384-387.

The anionic character of Th in HNO_3 was established and used as a means of separating it from U.

6619 A Chromatographic Analysis of the Free Amino-Acids, Organic Acids and Sugars in Flax *(Linum Usitatissimum).* I. A. M. Cruickshank. *Journal of the Science of Food and Agriculture,* v. 8, Jan. 1957, p. 26-30.

6620* Comparison of Low Temperature Crystallization and Urea Adduct Methods in the Analysis of Fatty Acids of Vanaspati. V. S. Patil and N. G. Magar. *Journal of Scientific & Industrial Research,* v. 15, sec. B, Nov. 1956, p. 650-654.

Urea adduct method gives better separation of unsaturated fatty acids.

6621* Controlled Potential Coulometry in Aqueous & Non-Aqueous Solutions. A. P. Madhavan Nair and S. Hamsath Ibrahim. *Journal of Scientific & Industrial Research,* v. 15, sec. B, Dec. 1956, p. 703-707.

Analysis can be accurately carried out in methanol and methanol-water media, and is applied for estimation of thiocyanate iodide.

6622 Selected Methods of Chemical Analysis for Thorex Process Control. W. W. Sabol and B. F. Rider. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1477, Sept. 1956, 67 p. (UF767 Un3.1ka Contin.)

Step-by-step procedures for measuring acidity, density, radiation, and contents of Th, U-233, and U-232.

6623* (English.) **On the Amount of Beryllium in Sea Water.** Masayoshi Ishibashi, Tsunenobu Shigematsu, and Yasuharu Nishikawa. *Kyoto University, Institute for Chemical Research, Bulletin,* v. 34, July 1956, p. 210-213.

Beryllium was determined fluorometrically with morin. Results of .03 and .38 μg. per l. were found in inland sea water and open ocean water respectively.

6624 Chemical Analysis of Binary Alloys of Platinum and Uranium. Martha S. Richmond, John R. Baldwin, and E. June Maienthal. *National Bureau of Standards (U. S. Atomic Energy Commission),* NBS-4555, Feb. 1956, 19 p. (UF767 Un3.1nb Contin.)

Platinum is determined by a $SnCl_2$ spectrophotometric method in the presence of U or by a sulfide-gravimetric method. Provision is made for the separation and/or determination of Cu, W, and U that might contaminate Pt sulfide precipitates.

6625 1956 Book of ASTM Methods for Chemical Analysis of Metals. 627 p. 1956. American Society for Testing Materials, Philadelphia. (QD133 Am35a)

Contains all of the current ASTM methods for the chemical analysis of ferrous and non-ferrous metals and alloys.

6626 Determination of Microgram Quantities of Carbon by Low-Pressure Combustion. J. H. Edgerton and H. G. Davis. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2211, Jan. 1957, 9 p. (UF767 U30 Contin.)

Method is based on combustion of the specimen in O at 135 mm. pressure, freezing out the CO_2, pumping out the excess O, and then measuring the CO_2 in the gas phase by means of a McLeod gage.

6627 Spectrophotometry in Analysis of Oils and Fats. VI. N. H. E. Ahlers. *Paint Technology*, v. 21, Jan. 1957, p. 6-8, 13.

Infra-red spectroscopy of alkyd resins, polypentaerythritols, and styrene copolymers. Raman spectroscopy. Flame photometry.

6628 Physical Methods in Chemical Analysis. Walter G. Berl, editor. v. III. 652 p. 1956. Academic Press, New York. (QD75 B45p)

Includes articles on gas chromatography; electrochromatography; field emission microscopy; flame photometry; sampling; microwave, nuclear resonance, and neutron spectroscopy; analytical distillation; and fluorescent X-ray analysis.

6629* Quick, Accurate Method for Magnesia Determination. Henry E. Gerhard. *Rock Products*, v. 60, Feb. 1957, p. 117-118, 120.

Buffering agents at pH 10 and an aqueous solution of H_2O_2 are added to the filtrate from an oxalate separation of Ca. Solution is titrated with EDTA reagent using Eriochrome Black T indicator.

6630* Separation of Some Disperse Dyes by Paper Chromatography. K. Elliott and L. A. Telesz. *Society of Dyers and Colourists, Journal*, v. 73, Jan. 1957, p. 8-11 + 1 plate.

Analysis using petroleum ether saturated with 98% methyl alcohol.

6631* An Atomic-Absorption Spectrophotometer and Its Application to the Analysis of Solutions. Barbara J. Russell, J. P. Shelton, and A. Walsh. *Spectrochimica Acta*, v. 8, Feb. 1957, p. 317-328 + 1 plate.

The sample is sprayed into a flame and the absorption by the latter of an atomic resonance line of the element to be estimated is measured, the apparatus being so arranged that the absorption measurement is independent of any radiation emitted by the flame.

6632* Photoelectric Fabry-Perot Interferometer for Assay of Lead and Uranium Isotopes. J. K. Brody, F. S. Tomkins, and M. Fred. *Spectrochimica Acta*, v. 8, Feb. 1957, p. 329-347.

6633* Rapid Absorptiometric Determination of Sulphide in Sulphate Pulp Black Liquor. J. D. H. Strickland and J. B. Risk. *Tappi*, v. 40, Feb. 1957, p. 91-94.

The Lauth violet absorptiometric sulfide determination was adapted for routine measurement of Na_2S in weak black liquor before and after air oxidation.

6634* Determination of Microquantities of Pentachlorophenol in Pulp and Paper. G. Luedemann, I. Sobolev, R. Russell, and E. Reed. *Tappi*, v. 40, Feb. 1957, p. 104-106.

The modified colorimetric method using methylene blue is subject to a minimum of interference.

6635 Ionization Chamber Assay of Radioactive Gases. B. M. Tolbert. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3499, Mar. 1956, 47 p. (UF767 U3u Contin.)

Ion chamber theory; samples and sample preparation; combustion of organic compounds to CO_2; design and construction of ion chambers, measurement of ion chamber currents, and approximate calibration data; detailed procedures for C^{14} and tritium assay.

See also: **6383** (analysis of grasses and clovers); **6486** (quantitative thermal analysis); **6661** (analysis of phenols); **6928** (analysis of Cr-plating baths); **7111** (determination of tin in foods); **7134** (analysis of fuel gases); **7483** (X-ray analysis of metals); **7498** (fluorescent X-ray analysis of alloys); **7717** (analysis of air).

CHEMISTRY—INORGANIC AND GENERAL

6636* (English.) **Studies on the Hydrolysis of Metal Ions. XVII. The Hydrolysis of the Uranium (IV) Ion, U^{4+}.** Sirkka Hietanen. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1531-1546.

Behavior is compared with the mechanism previously found for Th.

6637* (English.) **On the Sulfides, Selenides and Tellurides of Palladium.** Fredrik Grønvold and Erling Røst. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1620-1634.

Phase relationships were studied by means of X-rays.

6638 The Thermal Decomposition of Aqueous Chromic Acid and Some Properties of the Resulting Solid Phases. B. J. Thamer, R. M. Douglass, and E. Staritzky. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 547-550.

Aqueous chromic acid solutions in closed containers evolve O at an appreciable rate at 300 to 325 C. Solid decomposition products are CrO_2 and $HCrO_2$.

6639 Structure and Reactivity of the Oxyanions of Transition Metals. III. The Hypochromate Ion. N. Bailey and M. C. R. Symons. *Chemical Society, Journal*, Jan. 1957, p. 203-207.

In the absence of O, aqueous solutions of K_2CrO_4 containing KOH in large concentration are slowly converted at high temperatures into green solutions which are shown by analysis to contain quinquevalent Cr.

6640 Exchange of Chlorine-36 Between Chloride Ion and Phosphorus Oxychloride, Arsenic Trichloride, or Selenium Oxychloride. J. Lewis and D. B. Sowerby. *Chemical Society, Journal*, Jan. 1957, p. 336-342.

6641 The Action of Nitrosyl Chloride on Certain Silicates. I. R. Beattie. *Chemical Society, Journal*, Jan. 1957, p. 367-370.

Action on silver analcite and sodium metasilicate is explained in terms of an ion-exchange process involving nitrosonium cations.

6642 Equivalence Changes in Oxidation-Reduction Reactions in Solution: Some Aspects of the Oxidation of Sulphurous Acid. W. C. E. Higginson and J. W. Marshall. *Chemical Society, Journal*, Jan. 1957, p. 447-458.

Stoichiometric relationships in the reaction of various oxidizing agents. Kinetics of oxidation by 1-equivalent reagents.

6643* Encyclopedia of Chemical Reactions. v. VI. Samarium, Scandium, Selenium, Silicon, Silver, Sodium. C. A. Jacobson and Clifford A. Hampel, compilers. 438 p. 1956. Reinhold Publishing Corp., New York. (QD155 J15e)

A compilation of abstracts of reactions involving inorganic reagents.

6644* Peroxy Titanium Oxalate. D. P. Kharkar and C. C. Patel. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Nov. 1956, p. 287-306.

Preparation, structure, and properties.

6645* Use of Sodium Perborate in the Preparation of Sodium Chlorite. S. M. Mehta and D. J. Mehta. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 392-397.

Chlorine dioxide and sodium perborate give $NaClO_2$; the yield is not affected by the addition of H_2O_2 or boric acid in different ratios but is greatly enhanced in the presence of borax, NaOH, or Na_2CO_3.

6646 Methods for the Hydrolysis of Ethyl Silicate. H. G. Emblem. *Industrial Chemist*, v. 33, Feb. 1957, p. 55-58.

Sequence of hydrolysis and gelation; influence of HCl as catalyst, isopropyl alcohol as hydrolysis solvent; single and two-stage procedures; alkaline hydrolysis; application in refractories technology.

6647 A Nomograph for Correction of Boiling Points. R. Thomas Myers. *Journal of Chemical Education*, v. 34, Feb. 1957, p. 58-59.

6648 Some Physical Properties of Molten and Supercooled Gallium Trichloride. N. N. Greenwood and K. Wade. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 349-356.

6649 The Preparation of Rhodium (III) Perchlorate Hexahydrate. Gilbert H. Ayres and John S. Forrester. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 365-366.

Preparation by reaction of perchloric acid with rhodium(III) chloride. X-ray powder diffraction data. Compound is crystalline and water-soluble.

6650 Classification of Perovskite and Other ABO_3-Type Compounds. Robert S. Roth. *Journal of Research, National Bureau of Standards*, v. 58, Feb. 1957, p. 75-88.

Classification is on the basis of ionic radii of the constituent ions.

6651* Studies on the Preparation of Titanium Oxalate. P. P. Bhatnagar and T. Banerjee. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Dec. 1956, p. 715-720.

Oxalic acid reacts with titanium hydroxide forming titanyl oxalate and not titanium oxalate. Addition of absolute alcohol to titanyl oxalate solution, stabilized with excess of oxalic acid, results in the precipitation of the titanyl oxalate.

6652 Solubility of Sodium Monoxide in Liquid Sodium. O. N. Salmon and T. J. Cashman, Jr. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1653, Nov. 1956, 29 p. (UF767 Un3.1ka Contin.)

6653 Structure and Stability of Inorganic Azides. B. L. Evans and A. D. Yoffe. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 568-574 + 1 plate.

The explosive sensitivity is dependent on the ionization potential of the metal forming the azide.

6654 The Binary System Nitrogen-Oxygen at 1.3158 atm. A. H. Cockett. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 76-92.

The composition of vapor and liquid mixtures of N and O in equilibrium at 1.3158 atm. was measured using a dynamic method with continuous recirculation of the vapor.

6655* (German.) Alkali Earth Metal Hydride Iodides. **Über die hydridjodide der Erdalkalimetalle.** Paul Ehrlich and Harald Kulke. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 288, Dec. 1956, p. 156-170.

The compounds CaHI, SrHI, and BaHI were prepared by heating the respective metal hydride and iodide, or by heating the metal and the metal iodide, in an atmosphere of H at 900 C. Thermal and crystallographic data are presented.

6656* (Russian.) Composition and Pressure of Dissociation of a Stable Crystalline Hydrate of Uranium Tetrafluoride. **Sostav i davlenie dissotsiatsii ustoichivogo kristallogidrata chetyrekhftoristogo urana.** M. M. Popov and Iu. V. Gagarinskii. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 3-8.

The existence of a hydrate of the formula $UF_4 \cdot 2.5\ H_2O$ was established. Dissociation pressure in the range of 20 to 35 C, and the hydration heat of UF_4 + liquid water were determined.

6657* (Russian.) Study of Complex Compounds of Titanium With Chromotropic Acid and With 1,8-Dioxynaphthalene. **Izuchenie kompleksov titana s khromotropovoi kislotoi i 1,8-dioksinaftalinom.** A. K. Babko and O. I. Popova. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 138-146.

Optical characteristics of the complexes and changes in the equilibrium with the pH. Determination of their composition and stability by various methods.

CHEMISTRY—ORGANIC

6658* (English.) **Constituents of the Wood of *Juniperus communis* L.** Johan B-Son Bredenberg and Jarl Gripenberg. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1511-1514.

The neutral part of the extract contains a substance which probably is a mixture of ferruginol and some closely related compound, and also a yellow compound termed xanthoperol.

6659* (English.) **Studies on Arabogalactans. I. Products From the Mild Hydrolysis of the Arabogalactan From *Larix occidentalis*.** Hans Bouveng and Bengt Lindberg. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1515-1519.

The arabogalactan yielded a mixture of arabinose, galactose, two disaccharides, and a small trisaccharide fraction when hydrolyzed under conditions mild enough to cleave furanosidic linkages almost exclusively.

6660* (English.) **Synthesis of the Racemic and Optically Active Forms of 10-Methylnonadecanoic Acid.** Roberto Cavanna. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1527-1530.

6661* (English.) **Quantitative Bromination of Phenols.** Bengt Smith. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1589-1596.

Bromination of 47 phenols was carried out using 0.1 N potassium bromide-bromate solution and glacial acetic acid. Required conditions were established for the analysis of various types of phenols.

6662* (English.) **Transformation of 2-(Hydroxymethyl)-5-(Amino-Methyl)-Furan Into 6-Methyl-3-Pyridinol.** Niels Elming and Niels Clauson-Kaas. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1603-1605.

6663 Vinyl Derivatives of the Metals. I. Synthesis of Vinyltin Compounds. Dietmar Seyferth and F. G. A. Stone. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 515-517.

Synthesis of alkyl- and arylvinyltin compounds and of allyltrimethyltin by the Grignard method, and of the vinyltin chlorides by the Kocheshkov procedure. Vinyltin compounds show good thermal stability.

6664 The Interaction of 2-Methyl-2-Amino-3-Butanone Oxime With Some Transition Metal Ions. R. Kent Murmann. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 521-526.

Preparation of a series of coordination compounds.

6665 Alkylhydrazines. I. Formation of a New Diazo-Like Species by the Oxidation of 1,1-Dialkylhydrazines in Solution. William R. McBride and Howard W. Kruse. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 572-576.

The 1,1-dialkylhydrazines react with alkali halates and halogens in acidic media to form a new class of diazo-like compounds which exhibit remarkable stability as their conjugate acids but in neutral or basic solution immediately dimerize to form tetraalkyltetrazenes.

6666 Preparation and Properties of the Isomeric Forms of α-Amino- and α,ε-Diaminopimelic Acid. Roy Wade, Sanford M. Birnbaum, Milton Winitz, Robert J. Koegel, and Jesse P. Greenstein. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 648-652.

6667 The Alkaline Hydrolysis of Scopolamine Methoxymethochloride: A New Route to Scopine. J. Meinwald and O. L. Chapman. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 665-666.

6668 Synthesis of 1-Deazaguanine. Bert S. Gorton and William Shive. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 670-672.

Chelidamic acid dihydrazide was converted to the diazide and then to 4-hydroxy-2,6-pyridinedicarbamate via a Curtius reaction. Nitration of the latter product followed by hydrolysis and reduction yielded 2,3,6-tri-amino-4-pyridnol which was finally formylated and cyclized to produce 1-deazaguanine.

6669 The Preparation of Polymeric and Cyclic Urethans and Ureas From Ethylene Carbonate and Amines. Elizabeth Dyer and Harvey Scott. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 672-675.

6670 Reduction of the Products of Periodate Oxidation of Carbohydrates. IV. Hydrogenation With Palladium-Charcoal of the Dialdehydes From Methyl Glycosides. J. E. Cadotte, G. G. S. Dutton, Irwin J. Goldstein, Bertha A. Lewis,

F. Smith, and J. W. Van Cleve. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 691-697.

6671 The Reduction of Thioketones by a Model for a Coenzyme. Robert H. Abeles, Robert F. Hutton, and F. H. Westheimer. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 712-716.

Effects of *p*H, substituents in the thioketone and the dihydro compound, solvent, and deuterium substitution on the rate of reaction.

6672 Stereochemistry of the Opening of the Imine Ring With Ethylamine. Robert Ghirardelli and Howard J. Lucas. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 734-741.

6673 Glyceride Structure of Vegetable Oils by Countercurrent Distribution. II. Soybean Oil. C. R. Scholfield and Mary A. Hicks. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 77-80.

Oil is estimated to contain 5.2% dilinoleo-linolenin, 13.7% trilinolein, 9.2% oleolinoleo-linolenin, and 25.2% oleo-dilinolein. This is in agreement with a random distribution pattern.

6674* The Preparation of Aromatic Aldehydes. Kurt Kulka. *American Perfumer and Aromatics*, v. 69, Feb. 1957, p. 31-33.

The most recent direct methods.

6675* Progress in Perfumery Materials. I. Paul Z. Bedoukian. *American Perfumer and Aromatics*, v. 69, Feb. 1957, p. 34-37.

Review of current developments, covering odor, flower oils, analytical methods, and musk and ambergris compounds.

6676* (French.) Investigation on the Ethylene-Ketones. **Recherches sur les cétones éthyléniques. VI.** A Stereospecific Synthesis of Ketones of the Type R.CH=CH.CO.CH_3. **Synthèse stéréospécifique des cétones du type R.CH=CH.CO.CH_3.** René Heilmann, Gabriel de Gaudemaris, and Paul Arnaud. *Bulletin de la Société Chimique de France*, no. 2, Feb. 1957, p. 119-127.

A method for the stereospecific synthesis of various pairs of steric isomers of ethylene ketones. The infra-red absorption of these compounds is given.

6677* (French.) A Contribution to the Study of Citrate and Tartrate Complexes. **Contribution à l'étude des complexes des citrates et tartrates. II.** The Complex Formed by Cobalt and Citrate. **Le complexe du cobalt avec le citrate.** Carla Heitner-Wirgin and Isaac Eliezer. *Bulletin de la Société Chimique de France*, no. 2, Feb. 1957, p. 149-152.

Potentiometric and spectrophotometric tests were performed to determine the composition of the Co citrate complex starting from pH 6. The equilibrium constants were calculated at various pH levels and compared with Cu citrate constants.

6678* (French.) Chlorination of Tertiary Butylbenzene. **Chloration du tert-butylbenzène. II.** Study of the Nuclear Chlorination. **Étude de la chloration nucléaire.** Moïse Lerer, Claude Fabre, and Georges Hugel. *Bulletin de la Société Chimique de France*, no. 2, Feb. 1957, p. 173-181.

By polychlorination of tertiary-butylbenzene the following products were isolated: dichloro-3,4 and -2,5 tertiary butylbenzenes, trichloro-2,4,5 and -2,3,6 tertiary butylbenzenes, tetrachloro-2,3,4,5 tertiary butyl-1 benzene and others. Physical constants and infra-red absorption spectra are given.

6679 Studies of Hydroxyl Substituted Guaiacyl Compounds. E. A. Kvasnicka and R. R. McLaughlin. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 105-107.

A new identification reaction for the distinction between α- and β- or γ-substituted guaiacyl derivatives. Relations between structure and distribution coefficients. Synthesis of 1-(3-methoxy-4-hydroxyphenyl)-2-propanol.

6680 Steroids and Related Products. VII. The Synthesis of 17α-Methylcorticosterone. Ch. R. Engel. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 131-140.

6681 Toxic Fluorine Compounds. XIII. ω-Fluoroalkyl Ethers. F. L. M. Pattison, W. C. Howell, and R. G. Woolford. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 141-148.

Toxicological properties provide evidence for the rupture *in vivo* of the ether link. The compound 2-fluoro-1',2',2',2'-tetrachlorodiethyl ether (XIII) shows outstanding activity as a systemic insecticide.

6682 A Relationship Between the Conformations of Cyclohexane Derivatives and Their Physical Properties. R. B. Kelly. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 149-155.

Relationship is applied to a variety of polysubstituted monocyclic and polycyclic compounds, to cyclohexenes, and pyranosides.

6683 Triarylmethane Compounds as Redox Indicators in the Schoenemann Reaction. II. Syntheses of the Triarylmethanes. D. Morison Smith, R. Blanchfield, J. L. Thompson, and G. A. Grant. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 156-162.

Syntheses and properties of a series of 4,4'-thenylidene bis [N,N-dimethylaniline] compounds, variously substituted in the thiophene ring. Most effective indicator was 4,4'(5-methyl-4-propyl-2-thenylidene) bis[N,N-dimethylaniline].

6684 Hydropteridines. IV. 5:6:7:8-Tetrahydropteridine. P. R. Brook and G. R. Ramage. *Chemical Society, Journal*, Jan. 1957, p. 1-4.

The route to 5,6,7,8-tetrahydro-4-methylpteridine was extended for the preparation of 5,6,7,8-tetrahydropteridine.

6685 Phenanthridines. I. The Synthesis of Bromophenanthridines. G. M. Badger and W. F. H. Sasse. *Chemical Society, Journal*, Jan. 1957, p. 4-8.

2-, 3-, and 7-Bromophenanthridine were prepared by cyclization of the bromo-2-formamidodiphenyls with polyphosphoric acid.

6686 The Condensation of Azomethines With Hydrogen Sulphide and Aldehydes. D. Collins and J. Graymore. *Chemical Society, Journal*, Jan. 1957, p. 9-10.

6687 Perfluoroalkyl Derivatives of Nitrogen. V. The Mechanism of the Hofmann Reaction With Amides Containing Electronegative Groups. D. A. Barr and R. N. Haszeldine. *Chemical Society, Journal*, Jan. 1957, p. 30-39.

6688 Studies of a Cross-Linked Poly(Ethyleneimine) Ion-Exchange Resin. E. J. Shepherd and J. A. Kitchener. *Chemical Society, Journal*, Jan. 1957, p. 86-92.

Preparation of transparent, colorless rods of an anion-exchange resin based on poly(ethyleneimine) cross-linked by reaction with ethylene dibromide. Structure and properties.

6689 Organic Nitrates. I. Diphenylmethyl Nitrate. G. W. H. Cheeseman. *Chemical Society, Journal*, Jan. 1957, p. 115-123.

Reactions with nucleophilic reagents are typical of an ester undergoing unimolecular alkyl-oxygen heterolysis.

6690 A New and Specific Aromatization Reaction. II. Some Further Examples. P. A. Robins and James Walker. *Chemical Society, Journal*, Jan. 1957, p. 177-187.

6691 Steric Effects in the Oxidation of Hexitols With Periodate. J. C. P. Schwarz. *Chemical Society, Journal*, Jan. 1957, p. 276-278.

Oxidation of manitol, dulcitol, and sorbitol with a limited quantity of sodium periodate is shown to involve preferential attack on *threo*-glycol groups.

6692 Oxidations With Phenyl Iodosoacetate. VI. The Oxidation of Some Phenols Containing Electron-Attracting Substituents. A. R. Fox and K. H. Pausacker. *Chemical Society, Journal*, Jan. 1957, p. 295-301.

Several *p*-alkoxycarbonyl- or *p*-nitro-phenols were oxidized with phenyl iodosoacetate in benzene solution; 4-alkoxycarbonyl- or 4-nitro-2-iododiphenyl ethers were formed. *p*-Nitrophenol also yielded 5-hydroxy-2:4'-dinitrodiphenyl ether.

6693 The Organic Chemistry of Phosphorus. IV. The Thermal Decomposition of Tetra-Aryloxyphosphorus Monohalides: A New Method for the Preparation of Aryl Halides. D. G. Coe, H. N. Rydon, and B. L. Tonge. *Chemical Society, Journal*, Jan. 1957, p. 323-327.

6694* (German.) Iso-Dicyclopentadiene and Dehydro-Isodicyclopentadiene. **Über das Iso-dicyclopentadien und das Dehydro-iso-dicyclopentadien.** Kurt Alder, Franz Heinz Flock, and Paul Janssen. *Chemische Berichte*, v. 89, no. 12, 1956, p. 2689-2697.

Synthesis of iso-dicyclopentadiene and dehydro-iso-dicyclopentadiene which has two less H-atoms. Both hydrocarbons possess a symmetric constitution.

6695* (German.) A Contribution to the Study of Hydrogen-Deuterium Asymmetry. **Zur Kenntnis der Wasserstoff-Deuterium-Asymmetrie.** Randolph Riemschneider. *Chemische Berichte*, v. 89, no. 12, 1956, p. 2713-2717.

In order to find out if there are enantiomorphic organic compounds caused by isotopic substitution, deuterium 1,2,3,4,5,6-hexachloro-cyclohexane was synthesized. δ-1,2,3,4,5,6-hexachloro-1,2-dideutero-cyclohexane indicated a further H-D asymmetry.

6696* (German.) Investigations in the Azol Series. **Untersuchungen in der Azolreihe. IV.** Structure of Oxazolone-(2) and Oxazolthione-(2): Infra-Red Spectra of These and Related Compounds. **Die Struktur der Oxazolone-(2) und Oxazolthione-(2): IR-Spektren dieser und verwandter Verbindungen.** Rudolf Gompper and Heinz Herlinger. *Chemische Berichte*, v. 89, no. 12, 1956, p. 2825-2833.

6697* (German.) Characteristic Reactions for the Formation of Amino Sugars. **Modellreaktionen für die Bildung von Aminozuckern. I.** The Reactions of α-Hydroxycarbonyl Compounds With Aromatic Amines. **Die Reaktionen von α-Hydroxycarbonylverbindungen mit aromatischen Aminen. II.** The Reactions of α-Hydroxycarbonyl Compounds With Aliphatic Amines. **Die Reaktionen von α-Hydroxycarbonylverbindungen mit aliphatischen Aminen.** Kurt Heyns and Wolfgang Stumme. *Chemische Berichte*, v. 89, no. 12, 1956, p. 2833-2853.

6698* (German.) Osonhydrazones. **Über Osonhydrazone. IX.** Osonhydrazone Structure. **Zur Struktur der Osonhydrazone.** Günter Henseke and Gerd Badicke. *Chemische Berichte*, v. 89, no. 12, 1956, p. 2910-2921.

Synthesis of 3,6-anhydro-D-psicoson-methylphenylhydrazone. An acyclic structure was shown. Osonhydrazones were easily brominated.

6699* (Russian.) Diene Synthesis With Chloromethylvinylketone. **Dienovyi sintez s khlormetilvinilketonom.** Iu. A. Arbuzov and B. L. Diatkin. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1249-1251.

Results of reaction of chloromethylvinylketone with cyclopentadiene, cyclohexadiene-1,3, isoprene, 1,1'-dicyclohexenyl, and butadiene-1,3.

6700 Heterocyclic Compounds. v. VI. Six-Membered Heterocycles Containing Two Hetero Atoms and Their Benzo Derivatives. Robert C. Elderfield, editor. 753 p. 1957. John Wiley & Sons, New York. (QD400 E122h)

Deals with monocyclic dioxanes, benzodioxanes, sulfur analogs of dioxanes, pyridazines, cinnolines, pathalazine, pyrrimidine, quinazoline, pyrazines, piperazines, quinoxalines, monocyclic oxazines, benzoxazines, thiazines, phenazines, phenoxazines, and phenothiazines.

6701* Oxidations With Silver Iodide Dibenzoate. P. S. Raman. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Nov. 1956, p. 321-330.

Oxidation of erucic, petroselinic, and oleic acids with silver iodide dibenzoate in dry benzene resulted in the corresponding lower melting threo-dihydroxy acids, whereas benzene containing only a small quantity of water gave mainly the corresponding higher melting erythro-dihydroxy acids. A new method of 1:2-glycol cleavage using silver iodide dibenzoate is described.

6702* Studies in the Formation of Heterocyclic Rings Containing Nitrogen. II. The Position of Methyl Group in the 1:2-Disubstituted Benziminazole From 4-Methyl-o-Phenylenediamine and Benzaldehyde. N. V. Subba Rao and C. V. Ratnam. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Nov. 1956, p. 331-337.

1-Benzyl-2-phenyl-5-methyl- and 1-benzyl-2-phenyl-6-methyl benziminazoles were synthesized.

6703* Synthesis of Citreorosein and Aloe-Emodin. T. R. Rajagopalan and T. R. Seshadri. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 418-422.

Starting from chrysophanol and frangula-emodin the corresponding ω-hydroxy compounds were prepared by the N-bromosuccinimide method.

6704 Modulus of Rigidity and Penetration of Paraffin Waxes. W. M. Mazee. *Institute of Petroleum, Journal*, v. 43, Jan. 1957, p. 21-24.

Modulus of rigidity gives valuable information on mechanical properties. Procedure consists in measuring deformation in a bar of the wax on submitting it to a shearing stress at various temperatures.

6705* (Russian.) Synthesis of Organo-Silicon Compounds With Carbonyl and Carboxyl Groups. **Sintez kremneorganicheskikh soedinenii s karbonil'nymi i karboksil'nymi gruppami.** A. D. Petrov, E. A. Chernyshev, and M. Bisku. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 12, Dec. 1956, p. 1445-1447.

6706* (Russian.) Polyene Compounds. **Polienovye soedineniia. II.** Polyene Compounds With Heterocyclic Substitutes. **Polienovye soedineniia s geterotsiklicheskimi zamestiteliami.** B. M. Mikhailov and G. S. Ter-Sarkisian. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 12, Dec. 1956, p. 1448-1451.

By the action of α-picolyl Li and quinaldine Li on 3 methyl-6-phenylhexadiene-3,5-one-3, corresponding tertiary alcohols were formed. Butenols were obtained from the reaction of α-picolyl Li or quinaldine Li with cinnamic aldehydes.

6707* (English.) **The Structure of Artemisin.** Masao Sumi. *Japan Academy, Proceedings*, v. 32, Nov. 1956, p. 684-687.

6708 The Functions of the Components of Coal Tar Pitch With Regard to Its Viscous Behaviour and Colloid Structure. R. P. Badenhorst and G. W. Perold. *Journal of Applied Chemistry*, v. 7, Jan. 1957, p. 32-38.

6709 Liquid-Liquid Equilibrium Data for Ternary Systems Containing α-Picoline, Hydrocarbons and Water or Triethylene Glycol at 20°. E. J. Charles and F. Morton. *Journal of Applied Chemistry*, v. 7, Jan. 1957, p. 39-46.

6710 Chemistry of Organic Free Radicals in the Vapor Phase. II. Reactions of Alkoxy and Alkylperoxy Radicals; Energetics of Some Alkyl Radical Reactions. Harold E. De La Mare and William E. Vaughan. *Journal of Chemical Education*, v. 34, Feb. 1957, p. 64-70.

Hydrocarbon oxidation; peroxide decompositions; decomposition of nitrite and nitrate esters.

6711 Quinquevalent Compounds of Uranium. I. Alkoxides and Complex Chlorides. D. C. Bradley, B. N. Chakravarti, and A. K. Chatterjee. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 367-369.

Preparation and properties.

6712* Heat Treatment of Kamala Seed Oil. V. N. Ojha and J. S. Aggarwal. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Nov. 1956, p. 656-660.

Changes occurring in physical and chemical characteristics of kamala seed oil and its fractions when heated at 100, 150, and 200 C, in air and in an inert atmosphere, were investigated and compared with similar data for tung oil.

6713* Thiopegan Derivatives. X-XI. G. M. Sharma, H. S. Sachdev, K. S. Narang, and K. S. Dhami. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Dec. 1956, p. 687-695.

Synthesis of 8-methyl 10:11-thiopegan derivatives, 8-methyl-4-keto-3:4-dihydroguinazolyl-2-mercaptoacetophenones, 2-methyl-10:11-thiopegene-9:4-one, and 2-methylene-10:11-thiopegene-9:4-one.

6714 Organotin Compounds Find New Uses. Ernest S. Hedges. *Manufacturing Chemist*, v. 28, Jan. 1957, p. 16-17.

Use as stabilizers for plastics, and as anthelminthics and biocides. Future lines of research.

6715 Resistance of Terphenyls to Heat and Radiation. Eugene L. Colichman and Raymond F. Fish. *Nucleonics*, v. 15, Feb. 1957, p. 72-74.

Ortho-, meta-, and para-terphenyl were submitted to temperatures and radiation doses approaching reactor-operation conditions. Results indicate sufficient stability for use as reactor moderator and coolant.

6716 (English and German.) **Perspectives in Organic Chemistry.** Alexander Todd, editor. 527 p. 1956. Interscience Publishers, New York. (QD245 T56p)

Resonance, reaction mechanisms, aromaticity, stereochemistry, synthesis, biosynthetic theories, carbohydrates, nucleic acids, steroids, isotopes, microorganisms, conifer taxonomy, and chemotherapy are among the subjects reviewed.

6717* (Polish.) Properties, Methods of Isolating, and Applications of Pyrene. **Piren—własności, metody wydzielania, zastosowanie.** J. Szuba and U. Śnieżek. *Przemysł Chemiczny*, v. 12, Nov. 1956, p. 610-616.

Sources; properties; analysis; extraction; uses, especially in dyes.

6718* (Polish.) Alkoxy and Aryloxysiloxane Oils and Resins. **Oleje i żywice alkoksy i aryloksysiloksanowe.** W. Pawłowski and J. Młodecki. *Przemysł Chemiczny*, v. 12, Dec. 1956, p. 687-693.

Synthesis is based on partial hydrolysis of esters of orthosilicic acid.

6719 (French.) Synthesis and Properties of Branched Chain Aliphatic Hydrocarbons From C_{10} to C_{24}. **Synthèse et propriétés des carbures aliphatiques ramifiés en C_{10}-C_{24}.** A. D. Pétrov. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 11, Nov. 1956, p. 1471-1484.

New method uses the condensation of the pinacol-fluorohydrides with the organo-magnesium compounds.

6720* (Russian.) Investigation in the Field of Nucleophilic Additions. **Issledovanie po teorii nukleofil'nykh prisoedinenii. IV.** Addition of Hydrogen Iodide From Iodide Solutions. **Prisoedinenie iodistogo vodoroda iz rastvorov iodidov.** V. G. Ostroverkhov and E. A. Shilov. *Ukrainskii Khimicheskii Zhurnal*, v. 22, no. 6, 1956, p. 743-753.

Study of addition of HI to acetyldicarboxylic acid dimethyl ester in acetic acid, acetonitrile, methanol, and methanol-water; factors affecting the rate of reaction.

See also: **6598** (analysis of detergents); **6609** (aromatics in mineral oils); **7599** (organic coolants for atomic reactors); **7738** (rubber-asphalt mixtures); **7757** (chemistry of cupressales); **7766** (purification of dyes).

CHEMISTRY—PHYSICAL

6721* (English.) **Bond Energies in Transition Metal Complexes.** F. Albert Cotton. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1520-1526.

A simple method of calculating total bond energy.

6722* (English.) **A Kinetic Study by Measurements of Steady-State Potentials of Platinum in Persulphate Solutions Containing Ammonium and Silver Salts.** Sture Fronaeus. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1606-1613.

6723 Studies of Photochemical Reactions With a Long-Path Infrared Technique. William E. Scott. *Air Pollution Foundation, Report No.* 15, v. 2, Nov. 1956, p. 63-87. (TD884 Ai71.3r Vis.)

A long-path infra-red spectrometer was used to study photochemical reactions of air pollutants at low concentrations. The photochemical reaction of N with a series of organic compounds is reported.

6724 Photoactivated Surface Reactions. Jack G. Calvert. *Air Pollution Foundation, Report No.* 15, v. 2, Nov. 1956, p. 89-112. (TD884 Ai71.3r Vis.)

Photoactivated reactions on solid surfaces are reviewed as a background for evaluation of the possible contribution of particulate matter to smog-forming reactions.

6725 Structure and Properties of the Condensed Phosphates. XIII. Refractometry. Edward J. Griffith. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 509-513.

The apparent molar refractions of several sodium phosphates were determined as a function of concentration and interpreted in terms of the polarizability of the phosphate anions.

6726 The Behavior of the Glass Electrode in Hydrogen Peroxide Solutions. J. R. Kolczynski, E. M. Roth, and E. S. Shanley. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 531-533.

Glass electrode *p*H sets behave in a reversible and reproducible manner in H_2O_2 solutions of all strengths.

6727 The Radiation Chemistry of Ferrous Chloride Solutions. Harold A. Schwarz. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 534-536.

Radiation-induced oxidation kinetics.

6728 The Equilibrium Distribution of Light and Heavy Waters in a Freezing Mixture. John C. Posey and Hilton A. Smith. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 555-557.

Deuterium concentrates in the ice phase. The separation factor in solutions containing approximately 18 mol. % of the total H as deuterium was found to be 1.0211 ± 0.0007.

6729 Thermodynamic Properties of Calcium Pyrophosphate, 10 to 1700°K. Edward P. Egan, Jr. and Zachary T. Wakefield. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 558-561.

6730 Studies on the Chemistry of Halogens and of Polyhalides. X. The Reactions of Iodine Monochloride With Pyridine and With 2,2'-Bipyridine. Alexander I. Popov and Ronald T. Pflaum. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 570-572.

Preparation and isolation of addition compounds of pyridine and of 2,2'-bipyridine with ICl and with $HICl_2$. Absorption spectra of these compounds in acetonitrile solutions.

6731 X-Ray Diffraction Powder Data of Some Thiol Esters of Long Chain Fatty Acids. L. P. Witnauer, D. A. Lutz, G. S. Sasin, and R. Sasin. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 71-72.

Data for the benzyl, β-naphthyl, *n*-amyl, and *n*-hexyl thiol esters of myristic, palmitic, stearic, and lauric acids.

6732 The Configuration of a Polypeptide Chain and the Internal Rotation About Single Bonds. San-ichiro Mizushima and Takehiko Shimanouchi. Paper from "Borderland Problems Between Physical Chemistry and Physiology". Research Institute of Applied Electricity, Hokkaido University. p. 1-8. (QH505 As13b)

Dependence of chain configuration on azimuth angles of internal rotation. Stable configuration of a polypeptide chain.

6733 Studies on Bound Water. Ken-iti Higasi. Paper from "Borderland Problems Between Physical Chemistry and Physiology". Research Institute of Applied Electricity, Hokkaido University. p. 9-35. (QH505 As13b)

Thermodynamic, $CoCl_2$, and dielectric methods of measurement. Dielectric properties of bound water.

6734* Absorption of Carbon Dioxide in Solutions of Diethanolamine. D. R. Morris and S. B. Watkins. *British Chemical Engineering*, v. 2, Feb. 1957, p. 79-84.

Includes tabulated calculations for 0.51, 2.0, 3.5, and 5.0 N solutions.

6735* (French.) C-H Valence Frequencies in the Series Furane, Pyrrole, Thiophene, and Cyclopentadiene. Effect of Charge Distribution in the Molecule. **Fréquences de valence C-H dans la série furane, pyrrole, thiophène et cyclopentadiène. Influence de la répartition des charges dans la molécule.** Jeanne-Marie Lebas and Marie-Louise Josien. *Bulletin de la Société Chimique de France*, no. 2, Feb. 1957, p. 251-256.

Compounds were observed by infra-red spectroscopy. The results for the region of 3000 $cm.^{-1}$ were discussed.

6736 An Investigation of the Gas-Phase Oxidation of Acetaldehyde by Means of a Rapid-Scanning Mass Spectrometer. L. P. Blanchard, J. B. Farmer, and C. Ouellet. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 115-123.

In normal slow oxidation, peracetic acid was formed and then decomposed into CO_2, methanol, and water. Under flame conditions peracetic acid built up in an autocatalytic manner during the induction period and vanished suddenly at the onset of the flame.

6737 Ultraviolet Irradiation of Pyrimidine Derivatives. I. 1,3-Dimethyluracil. A. M. Moore and C. H. Thomson. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 163-169 + 1 plate.

The isolation, analysis, and synthesis of the principal product of the ultra-violet (2537 Å) irradiation of aqueous 1,3-dimethyluracil made it possible to establish that the irradiation results in hydration of the 5:6 double bond of the uracil ring to form 1,3-dimethyl-6-oxyhydrouracil.

6738 A Quantitative Infrared Spectrometric Study of Molecular Association in Alcohols. Adolf Ens and F. E. Murray. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 170-175.

Absorption spectra of methanol, ethanol, isobutanol, *tert*-amyl alcohol, and octanol-2 were studied in the wavelength region of the first harmonic of the O-H vibration.

6739 The Flash Photolysis of Diacetylene. J. H. Callomon and D. A. Ramsay. *Canadian Journal of Physics*, v. 35, Feb. 1957, p. 129-133 + 1 plate.

6740 Ionic Mobilities in Argon and Helium Liquids. R. L. Williams. *Canadian Journal of Physics*, v. 35, Feb. 1957, p. 134-146.

Mobilities of ions and electrons were measured in liquid A at 90 K and in liquid He from 4.2 to 1.4 K.

6741 Emission Band Spectra of Nitrogen. A Study of Some Singlet Systems. Alf Lofthus. *Canadian Journal of Physics*, v. 35, Feb. 1957, p. 216-234.

6742 Diaryl-2:2'-Disulphonic Acids and Related Compounds. III. Optical Activity and Optical Stability in the 1:1'-Dinaphthyl Series. W. L. F. Armarego and E. E. Turner. *Chemical Society, Journal*, Jan. 1957, p. 13-22.

6743 Dynamic Contact Angles. I. Changes in Air-Solution-Solid Contact Angles With Time. T. A. Elliott and L. Leese. *Chemical Society, Journal*, Jan. 1957, p. 22-30 + 1 plate.

Rates of change depend on the chain length of the solute molecules and on the concentration of the solution.

6744 Electric Dipole Moment Studies. II. The Dielectric Polarisation of Cyclic Ethers in the Vapour Phase. W. L. G. Gent. *Chemical Society, Journal*, Jan. 1957, p. 58-62.

Measurement of ethylene oxide, trimethylene oxide, and tetrahydrofuran vapors.

6745 The Activation of Carbon-Carbon Double Bonds by Cationic Catalysts. III. The Coloured Species Formed by the Interaction of 1:1-Di-*p*-Methoxyphenylethylene With Trichloroacetic Acid in Benzene. Alwyn G. Evans, Peter M. S. Jones, and J. H. Thomas. *Chemical Society, Journal*, Jan. 1957, p. 104-111.

6746 Adsorption From Binary Liquid Mixtures on Silicic Acid Gel. I. D. C. Jones and G. S. Mill. *Chemical Society, Journal*, Jan. 1957, p. 213-225.

6747 Kinetics of the Reaction Between Ethyl Iodomalonate and Iodide Ions. R. P. Bell and P. Engel. *Chemical Society, Journal*, Jan. 1957, p. 247-253.

6748 Thermodynamics of Ion Association. III. Some Thallous Ion Pairs With Univalent Anions. V. S. K. Nair and G. H. Nancollas. *Chemical Society, Journal*, Jan. 1957, p. 318-323.

Solubilities of thallous iodate and bromide in various salt solutions; conductivities of thallous chloride and bromide solutions; thermodynamic association constants.

6749 The Formation of Iodine Cations. I. Magnetic Evidence. M. C. R. Symons. *Chemical Society, Journal*, Jan. 1957, p. 387-392.

Magnetic-susceptibility measurements on blue solutions of iodine in oleum show that they contain a paramagnetic material. This is taken as good evidence for the presence of the free iodine cation.

6750 The Effect of Solvent on a Simple Ion-Dipole Reaction. II. The Rate of the Methyl Iodide-Iodide Ion Exchange in Five Different Solvents. E. R. Swart and L. J. le Roux. *Chemical Society, Journal*, Jan. 1957, p. 406-410.

The activation energies and collision diameters were calculated. Rate differences are attributed to a change in activation energy. Variation in the dielectric constant appears to be the predominant factor in determining reaction rates.

6751 Diffuse Reflexion Spectra in the Near Infrared Region. J. D. S. Goulden. *Chemistry & Industry*, no. 5, Feb. 2, 1957, p. 142-143.

Gives spectra of casein, tripalmitin, hydrated calcium sulfate, and paper.

6752* (French.) Membranes and Dialysis. **Membrane et dialyse.** M. J. Mossé. *Chimie Analytique*, v. 39, Jan. 1957, p. 10-19.

A study of diffusion in liquids and derivation of an equation of dialysis. Theoretical considerations, apparatus, and applications of the method.

6753* (German.) Determination of Size and Structure of Porous Materials and Catalysts by the Method of Physical Adsorption. **Bestimmung der grösse und struktur der oberfläche poröser stoffe und katalysatoren mittels physikalischer adsorption. I.** Equipment. Adsorption of Nitrogen and Argon on Aluminum Oxide. **Apparatur. Die adsorption von stickstoff und argon an aluminiumoxyd.** V. Daneš. *Collection of Czechoslovak Chemical Communications*, v. 21, Oct. 1956, p. 1122-1139.

6754* (German.) The System Sulfur Dioxide-Dimethylaniline. **Das System Schwefeldioxyd-Dimethylanilin. I.** The Absorption Isotherms. **Die Absorptionsisothermen. II.** Heat of Solution. **Die Lösungswärmen.** J. Balej and A. Regner. *Collection of Czechoslovak Chemical Communications*, v. 21, Dec. 1956, p. 1545-1559.

6755* (French.) Disturbance of the Absorption Spectrum in the Ultra-Violet Near the Vapors of Some Monosubstituted Halogenated Derivatives of Benzene by Inert Gases Compressed up to 1500 kg./cm^2. **Perturbation du spectre d'absorption dans l'ultraviolet proche des vapeurs de quelques dérivés halogénés monosubstitutés du benzène par des gas étrangers comprimés jusqu'à 1500 kg/cm^2.** Boris Oksengorn. *Comptes Rendus*, v. 244, Jan. 28, 1957, p. 574-577.

A study of the displacements of the ultra-violet absorption spectra of the vapors of fluorobenzene, chlorobenzene, and bromobenzene, caused by compressed nitrogen and argon.

6756* (French.) The Order-Disorder Transformation in the Cubic Ferric Oxide Phase. **Sur la transformation ordre-désordre dans la phase sesquioxyde de fer cubique.** Isaac Behar and Robert Collongues. *Comptes Rendus*, v. 244, Jan. 28, 1957, p. 617-619.

6757* (Russian.) On the Problem of Activity Coefficients for Binary Mixtures of Non-Electrolytes. **K voprosu o koeffitsientakh aktivnosti dlia binarnykh smesei neelektrolitov.** E. Rukenshtein and O. Smilgel'skii. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1282-1285.

An attempt to derive a more satisfactory mathematical equation for studying mixtures of methylethylacetone N heptane.

6758* Comparison and Evaluation of the Absolute Values of Paramagnetic Resonance Absorption in Some Powders. K. Sundaramma. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Nov. 1956, p. 345-350.

Mixtures of the powders of copper sulfate pentahydrate, chrome alum, and cupric ammonium oxalate dihydrate with manganous sulfate monohydrate are studied.

6759* Studies in Phase Rule. I. The System Ammonium Sulphate-Water-Methanol at 30°C. The System Ammonium Nitrate-Water-Methanol at 30°C. G. Aravamudan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 375-386.

Neither system reveals the formation of solvated solid phases or of binary solutions. Methanol greatly reduces the aqueous solubility of $(NH_4)_2SO_4$ but has little effect on that of NH_4NO_3 when added in moderate amounts.

6760* Polarographic Behaviour of Cadmium, Copper, Lead, Nickel, Cobalt, Zinc and Iron in Ethanolamines and Potassium Sulphate or Nitrate. R. S. Subrahmanya. *Indian Institute of Science, Journal*, v. 38, sec. A, Oct. 1956, p. 245-248.

Evidence for the formation of complexes.

6761* (Spanish.) The Thermodynamic Theory of Equilibrium Diagrams. **La teoria termodinamica de los diagramas de equilibrio. IV.** Non-Electrolytic Solutions. **Soluciones de no electrolitos.** Francisco Muñoz del Corral. *Instituto del Hierro y del Acero*, v. 9, Oct.-Dec. 1956, p. 1120-1128.

Study of the chemical potentials in ideal, regular, and diluted solutions.

6762* (Russian.) Reaction Mechanism of Hydration and Dehydration in the Presence of Zinc Halides. **O mekhanizme reaktsii gidratatsii i degidratatsii v prisutstvii galogenidov tsinka.** A. B. Kuchkarev and N. I. Shuikin. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 12, Dec. 1956, p. 1469-1477.

A study of olefin hydration and alcohol dehydration with Zn Cl_2 or $ZnBr_2$ as catalysts. A possible structure of the intermediate complexes is offered.

6763 The Kinetics of the Catalytic Hydrogenation of Benzene on Supported Nickel and Nickel Oxide Catalysts. R. L. Motard, R. F. Burke, L. N. Canjar, and R. B. Beckmann. *Journal of Applied Chemistry*, v. 7, Jan. 1957, p. 1-14.

6764* (French.) A Contribution to the Study of the Influence of Substituents on the Quinones. **Contribution a l'étude de l'influence des substituants sur les quinones. I.** Infra-Red Spectroscopic Study of a Group of *p*-Benzoquinones and of 1,4-Naphthoquinones Substituted in the Region of 1600 $cm.^{-1}$. **Étude par spectroscopie infra-roug d'un groupe de *p*-benzoquinones et de 1-4 naphtoquinones substituées dans la région de 1600 $cm.^{-1}$.** Marie-Louise Josien and Jean Deschamps. *Journal de Chimie Physique*, v. 53, Nov.-Dec. 1956, p. 885-894.

Effect on the valence vibrations of carbonyls was examined for a group of p-quinones.

6765* (French.) Chemical Effects of Nuclear Radiation on 8-Hydroxyquinoline in Aqueous Solution. **Effets chimiques des rayonnements nucléaires sur la 8-hydroxyquinoleine en solution aqueuse.** S. Kertés, M. Lederer, and M. Lefort. *Journal de Chimie Physique*, v. 53, Nov.-Dec. 1956, p. 959-962.

6766 Atomic Weights Computed From Physical Measurements. A. H. Wapstra. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 329-332.

Chemical atomic weights are calculated from isotopic abundance ratios and earlier computations of isotopic masses.

6767 Ionic and Covalent Forms of the Gallium Trihalides. N. N. Greenwood and I. J. Worrall. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 357-364.

An investigation of electrical properties.

6768 Preparation and Properties of Strong Base Type Collodion Matrix Membranes. Melvin H. Gottlieb, Rex Neihof, and Karl Sollner. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 154-159.

6769 The Transitory Overshooting of Final Equilibrium Concentrations in Membrane Systems Which Drift Toward the Gibbs-Donnan Membrane Equilibrium. Rex Neihof and Karl Sollner. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 159-163.

The existence of overshooting and depletion effects was verified experimentally in several systems with permselectiv collodion matrix membranes. Possible biological significance is discussed.

6770 Electrogravitational Transport at Synthetic Ion Exchange Membrane Surfaces. Vincent J. Frilette. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 168-174.

The electrogravitational membrane process suggests a new approach to a commercial method for water demineralization and ion fractionation.

6771 Salt Filtering by Ion-Exchange Grains and Membranes. J. G. McKelvey, Jr., K. S. Spiegler, and M. R. J. Wyllie. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 174-178.

A 0.1 solution of NaCl was forced through a "Permaplex C-10" cation-exchange resin membrane in the Na form. Various resin granules were equilibrated with a salt solution, separated, and subjected to pressure. In both cases the resulting solution was depleted in salt.

6772 Thermodynamic Functions for the Solution of Silica in Water. S. A. Greenberg. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 196-197.

6773 Wien Effect in Simple Strong Electrolytes. Lars Onsager and Shoon Kyung Kim. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 198-215.

Results appear as double integrals, which are reduced to closed form by elliptic substitutions. Alternative forms for evaluation by descending power series or by numerical quadrature are described.

6774 The Relaxation Effects in Mixed Strong Electrolytes. Lars Onsager and Shoon Kyung Kim. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 215-229.

Separation of the Onsager-Fuoss equations for the modification of interionic forces by conduction, diffusion, and viscosity in mixed electrolytes is greatly facilitated by use of an algebraic device.

6775 The Molecular Polarizations and Apparent Dipole Moments of Titanium Tetrachloride, Tin Tetrachloride and Tin Tetraiodide in Non-Polar Solvents. A. R. Tourky and H. A. Rizk. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 231-233.

6776 Vapor Pressures and Cryoscopic Data for Some Aliphatic Dinitroxy and Trinitroxy Compounds. M. D. Kemp, S. Goldhagen, and F. A. Zihlman. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 240-242.

6777 Exchange Diffusion of Ions of Similar Mobility. L. G. Longsworth. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 244-248.

At 25 C the limiting mobilities, and hence the ion diffusion coefficients at zero concentration, of chloride and iodide ions in aqueous solution differ by only 0.7%. The process of exchange diffusion of these ions at a boundary between dilute equimolar solutions of KI and KCl was studied in the concentration range from 0.01 to 1 mole per liter, with both Na and K as the common ion.

6778 Some Isotopic Exchange Reactions of Iodine Cyanide. F. E. Jenkins and G. M. Harris. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 249-250.

Three typical isotopic reactions with I^{131} and $(C^{14}N)^-$ were investigated.

6779* (English.) **A Molecular Orbital Discussion of the Hammett Equation. Semi-Empirical Interpretation on the Abnormality of the Benzyl Anion Type Substituent.** Teiji Tsuruta, Takayuki Fueno, and Junji Furukawa. *Kyoto University, Institute for Chemical Research, Bulletin*, v. 34, July 1956, p. 214-223.

Substituent effects in electrophilic, nucleophilic, and radical reactions are discussed.

6780 How Radiation Affects Organics in Solvent Extraction of Fuel. J. H. Goode. *Nucleonics*, v. 15, Feb. 1957, p. 68-71.

In tributyl-phosphate-naphtha extraction systems for recovering U, Pu, and Th from irradiated fuels, solvent radiation damage is noticeable at 0.5 w.-hr. per l. Process is not seriously affected below 20 w.-hr. per l.

6781 Emission and Excitation Spectra of Thallium-Activated Potassium Chloride at Low Temperatures. David A. Patterson and Clifford C. Klick. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 401-406.

6782* (English.) **Intermolecular Potential Between Large Molecules.** Akira Isihara and Ryuzo Koyama. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 32-39.

Assumes the Lennard-Jones potential between atoms of polyatomic molecules.

6783* (English.) **Dependence of Quadrupole Coupling Constant on the Vibrational State in ICN Molecule.** Takeshi Oka, Hiromasa Hirakawa, and Akira Miyahara. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 39-42.

The microwave spectrum of the hyperfine components of two rotational transitions of the ICN molecule was measured.

6784* (English.) **Microwave Spectrum of Vinylidene Chloride.** Shōzō Sekino and Tetsuji Nishikawa. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 43-48.

Above was analyzed and the molecular parameters were determined.

6785* (English.) **Line Width of the Pure Quadrupole Resonance of Bromine in $NaBrO_3$.** Yoshitaka Kôi. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 49-53.

The above was measured at melting ice and liquid O temperatures.

6786* Chemical Evidence of Track Effects in the Radiolysis of Liquids. Adolphe Chapiro. *Radiation Research*, v. 6, Jan. 1957, p. 11-26.

6787 The Mechanism of the Photolysis of Acetamide. B. C. Spall and E. W. R. Steacie. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 1-15.

The main primary process is the breakdown of the molecule into CH_3 and $CONH_2$ radicals, but this is probably accompanied by a second process yielding CH_3CN and H_2O.

6788 Frozen Free Radicals. Charles M. Herzfeld and Arnold M. Bass. *Scientific American*, v. 196, Mar. 1957, p. 90 + 7 pages.

Molecular fragments, which normally have a fleeting existence during chemical reactions, can now be preserved by rapid cooling. The study of their properties is an exciting new field of research.

6789* (English.) **Steric Effects in the Electronic Spectra of Substituted Benzophenones.** R. F. Rekker and W. Th. Nauta. *Spectrochimica Acta*, v. 8, Feb. 1957, p. 348-355.

In benzophenone and in symmetrically substituted derivatives, both phenyl groups have the same degree of coplanarity with respect to C=O. There is not much difference between the methyl, ethyl, and *i*-propyl groups in their respective abilities to give decreases in oscillator strength.

6790* (English.) **Effects of Grinding During the Preparation of Alkali-Halide Disks on the Infra-Red Spectra of Hydroxylic Compounds.** V. C. Farmer. *Spectrochimica Acta*, v. 8, Feb. 1957, p. 374-389.

Changes in the spectra of phenols and organic acids induced by grinding with alkali halides are ascribed to the adsorption of molecules on the surface of the alkali halides through their hydroxyl groups.

6791* (Russian.) Thermal Conductivity of Oils. **Teploprovodnost' masel.** N. V. Tsederberg. *Teploenergetika*, v. 4, Feb. 1957, p. 52-53.

Shows that the oils may be compared to unassociated liquids.

6792 High Temperature Dissociation Pressure Studies of the Uranium-Hydrogen System. George G. Libowitz and Thomas R. P. Gibb, Jr. *Tufts University (U. S. Atomic Energy Commission)*, NYO-7543, Dec. 1956, 19 p. (UF767 U3ny Contin.)

Pressure-composition isotherms were obtained over the temperature range 450 to 650 C at pressures up to 65 atm. Effect of thermal gradients is discussed.

6793 Nuclear Magnetic Resonance Studies of Some Inorganic Molecules and Ions. Richard Edwin Poulson. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3567, Nov. 1956, 59 p. (UF767 U3u Contin.)

The F^{19} nuclear magnetic-resonance spectra of several aqueous complex metallic fluoride systems were studied.

6794* (German.) Experimental Results Concerning the Primary Reactions in Carbon Combustion. **Experimentelle Ergebnisse über die Primärreaktionen bei der Kohlenstoffverbrennung.** M. Rossberg. *Zeitschrift für Elektrochemie*, v. 60, nos. 9-10, 1956, p. 952-956.

Combustion tests were performed, using the fluidized carbon method, between 520 and 1420 C and at various pressures, for study of results obtained with graphitized porous spectrally pure carbon.

6795* (German.) Tautomerism and Infra-Red Absorption Spectrum of Acetylacetone. **Tautomerie und Infrarot-Absorptionsspektrum des Acetylacetons.** R. Mecke and E. Funck. *Zeitschrift für Elektrochemie*, v. 60, nos. 9-10, 1956, p. 1124-1130.

Effects of temperature and solvent on the infra-red spectra of acetylacetone made it possible to relate the absorption bands observed to the two tautomeric forms. A vibrational analysis of the end molecule was performed and the frequencies studied.

6796* (German.) Infra-Red Spectra of the Coordinate Bonds of Aluminum Hydride With Trimethylamine and Tetrahydrofuran. **Die Ultrarot-Spektren der Koordinationsverbindungen des Aluminium-Wasserstoffs mit Trimethylamin und Tetrahydrofuran.** Werner Zeil, Rolf Dautel, and Wolfgang Honsberg. *Zeitschrift für Elektrochemie*, v. 60, nos. 9-10, 1956, p. 1131-1137.

A study of the infra-red spectra of $AlH_3 \cdot N(CH_3)_3$, $AlH_3 \cdot 2N(CH_3)_3$, and $AlH_3 \cdot 1$ tetrahydrofuran, in the range of 1-15 μ, in various solvents, and in the solid state.

6797* (German.) The "K"-Edge-Fine Structure of Complexes of the Transitional Elements From Chromium to Zinc. **Die *K*-Kanten-Feinstruktur von Komplexen der Übergangselemente Chrom bis Zink. I-II.** Klaus Böke. *Zeitschrift für Physikalische Chemie (Frankfurt)*, v. 10, Jan. 1957, p. 45-82.

Fine structure of the X-ray absorption curves is discussed and compared with theoretical data. Study of carbonyl groups and cyano complexes in respect to the theory of molecular levels.

6798* (German.) Determining the Saturation Capacity in Artificial Exchange Resins. **Über die Bestimmung der Sättigungskapazität bei Austausch-Kunstharzen.** G. Günther and H. Staude. *Zeitschrift für Physikalische Chemie (Leipzig)*, v. 206, Nov. 1956, p. 124-138.

Methods used in determining saturation values of the exchange isotherms.

6799* (Russian.) Chemistry of Variable Composition Compounds. **Khimiia soedinenii peremennogo sostava. VI.** Titanium-Oxygen System. **Sistema titan-kislorod.** S. M. Ariia, M. P. Morozova, and E. Wolf. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 13-22.

Preparations and methods for their calorimetric determination. Enthalpy of formation of titanium oxides, and their chemical composition. Variable compositions and the law of multiple proportions.

6800* (Russian.) Study of Titanium-Pyrocatechin Complexes. **Izuchenie pirokatekhinatnykh kompleksov titana.** A. K. Babko and O. I. Popova. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 147-156.

Optical characteristics of pyrocatechin Ti complexes. Effect of pH on their formation and effect of concentration. Isomolecular series; equilibrium.

6801* (Russian.) Formation of SiB_3-Phase in the System Silicon-Boron. **Ob obrazovanii fazy SiB_3 v sisteme kremnii-bor.** M. A. Gurevich, V. A. Epel'baum, and B. F. Ormont. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 206-208.

A review of literature on the phase characteristics and lattice structures of SiB_3.

6802* (Russian.) Solubility Study of the System $UO_2C_2O_4$-$H_2C_2O_4$-H_2O. **Izuchenie rastvorimosti v sisteme $UO_2C_2O_4$-$H_2C_2O_4$-H_2O.** K. A. Bol'shakov, S. S. Korovin, V. E. Pliushchev, and T. A. Ermakova. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 222-228.

System solubility at 0, 25, 40, 50, and 70 C; description of the two solid phases, $UO_2C_2O_4 \cdot 3H_2O$ and $H_2C_2O_4 \cdot H_2O$, in the system.

6803* (Russian.) Physical-Chemical Investigation of Reactions Between Titanium Tetrachloride and Monobasic Complex Acids. **Fiziko-khimicheskoe issledovanie vzaimodeistviia chetyrekhkhloristogo titana s slozhnymi efirami odnoosnovnykh kislot. IX.** Reaction Between Titanium Tetrachloride With n-Butyl-Chloroacetate, and With Certain Trichloroacetic

Acid Esters. **Vzaimodeistvie chetyrekhkhloristogo titana s n-butilkhloratsetatom i s nekotorymi efirami trikhloruksusnoi kisloty.** Iu. A. Lysenko. *Zhurnal Obshchei Khimii*, v. 26, Dec. 1956, p. 3273-3279.

6804* (Russian.) Method of Determination of the Activity of a Skeletal Nickel Catalyst by Means of a Cementation Reaction. **Metod opredeleniia aktivnosti skeletnogo nikelevogo katalizatora s pomoshch'iu reaktsii tsementatsii.** A. I. Kriagova. *Zhurnal Obshchei Khimii*, v. 26, Dec. 1956, p. 3280-3283.

Measurements in terms of cementation ability in $CuSO_4$ solutions.

See also: **6487** (mathematics of multicomponent systems); **6557** (theory of chromatography); **7565** (behavior of tetralin in liquid Na); **7698** (ion selective membranes).

COATINGS

6805* (German.) Aluminum Painting of Wood. **Aluminiumanstrich auf Holz.** F. Falkenstätter. *Aluminium Ranshofen, Mitteilungen*, v. 4, Dec. 1956, p. 46-48.

Protection of wooden material exposed to weathering by Al paint.

6806 Flexibility of Thin Porcelain Enameled Sheet Steel. A. G. Eubanks, J. R. Crandall, and J. C. Richmond. *American Ceramic Society Bulletin*, v. 36, Feb. 1957, p. 59-63.

Thin low-carbon steel strips were given porcelain enamel applications ranging from 0.0017 to 0.0063 in. thick, deformed around cylindrical blocks of various radii of curvatures and inspected to determine if failure of the enamel by cracking had occurred.

6807 Driers and Addition Agents. Charles Gardner. *American Paint Journal*, v. 41, Feb. 18, 1957, p. 77 + 10 pages.

Specifications and typical properties of naphthenic driers; use of Pb, Ca, Co, Mn, Zn, and Fe; drier calculations; recommendations for drying oils, alkyds, and chemically treated oils; emulsive driers.

6808 Weathering Properties of Single Pigment Linseed Oil Paints. J. R. Rischbieth and K. R. Bussell. *Commonwealth of Australia, Dept. of Supply, Defence Standards Laboratories Report* 225, Apr. 1956, 13 p. (Tl Au78.2r Vis.)

Numerous paints were exposed on wood and steel panels for two yrs. under Australian climatic conditions to determine the influence of the pigments on the weathering properties.

6809* (French.) Surface Treatment of Metals Such as Steel, Aluminum, and Zinc Before Painting or Coating With Oil. **Traitement des surfaces avant peinture ou huilage des métaux tels que l'acier, l'aluminium, le zinc.** Cl. Hess. *Corrosion et Anticorrosion*, v. 5, Jan. 1957, p. 19-24.

Industrial treatments and their applications on steel and nonferrous metals; a special oiling process for small parts; painting light alloys and Zn.

6810 Different Methods for the Determination of the Thickness of the Silver Film. P. Sen and P. S. Rao. *Glass Industry*, v. 38, Feb. 1957, p. 89, 112.

Comparison of methods involving volumetric analysis by titration, direct weighing, and Fizeau's iodine crystal test indicate that the former is quickest and most accurate.

6811* Can and Drum Coatings. Eric E. V. Sharpe. *Industrial Finishing (London)*, v. 9, Jan. 1957, p. 326-328.

Types of exterior protection and decoration; interior lacquer linings; lacquers for food containers.

6812 Wear Protection of Mild Steel by Phosphating. J. W. Midgley. *Iron and Steel Institute, Journal*, v. 185, Feb. 1957, p. 215-224.

A microscopic study of the change in the nature of mild-steel surfaces phosphated in an accelerated Fe phosphate, or an accelerated Fe-Mn phosphate bath, and of the changes during subsequent wear tests.

6813 Silicone Coatings for Metal Products. L. F. Stebleton. *Materials & Methods*, v. 45, Feb. 1957, p. 112-115.

Properties and applications.

6814* Aqueous Coatings. I. Aqueous Vehicles. Philip Heiberger. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Feb. 1957, p. 100-158.

A critical review of aqueous vehicles, pigments in aqueous suspensions, and latex paint formulation with special emphasis on unsolved problems in emulsion systems.

6815* Coatings Based on Blends of Polyamide and Epoxy Resins. David Glaser, Don Floyd, and Harold Wittcoff. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Feb. 1957, p. 159-169.

Films dry quickly, are hard, glossy, decorative, flexible, and have good adhesion. They have good resistance to alkalies, acids, boiling water, aliphatic hydrocarbons, and oils.

6816* Outdoor Durability of Tall Oil Phthalic Alkyds. R. D. Bitting, A. D. Sill, and E. R. Mueller. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Feb. 1957, p. 170-172, 173-177.

Various types of acid-refined and distilled tall oil vehicles were compared with synthetic tall oil vehicles. The data obtained show that phthalic alkyds made from both acid-refined and distilled tall oils have comparable outdoor durability if their chemical properties are essentially the same. These properties include per cent rosin, acid number, dimerization and viscosity of tall oil, and oil content of the alkyd.

6817* Factors Affecting Economic Optimum Paint Milling Time. Chester P. Baker and Peter Virtue. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Feb. 1957, p. 178-187.

From data taken at different points in the milling cycle with respect to film thickness, hiding power, and fixed and direct manufacturing costs, a balance can be struck which will give the economic optimum milling time.

6818* Hiding Power From Only Photometric Measurements. Parker B. Mitton. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, Feb. 1957, p. 188-201.

New approach requires an application of the Kubelka-Munk two-constant theory of light scattering, does not require measurement of film thickness.

6819 Colorimetry in the Paint Industry. A. J. Seavell. *Oil & Colour Chemists' Association, Journal*, v. 40, Feb. 1957, p. 87-114.

Fundamentals of a system for color measurement; measurement of reflectance and color quality; color stability of reference standards.

6820 Assessment of Lightfastness. J. G. Gillan. *Oil & Colour Chemists' Association, Journal*, v. 40, Feb. 1957, p. 129-135.

A report on the progress of a program of assessing color change in paints after progressively longer exposure periods.

6821* The Effect of the Chromic Acid Rinse on Phosphate Coatings. Jodie Doss, W. Dennis McHenry, and Stanley L. Eisler. *Organic Finishing*, v. 18, Feb. 1957, p. 4-6, 8.

Caution should be exercised in recommending chromic acid rinses for the light-weight phosphate coatings used as undercoatings for paint films. The amount of material removed from the heavier type coatings is insignificant, and use of 0.30 oz. CrO_3 per gal. rinse is recommended.

6822* Positive Displacement Metering. Provides Accurate Measurement in Paint and Varnish Processing. Paul Mankin. *Paint and Varnish Production*, v. 47, Feb. 1957, p. 31-34.

Meter design and selection, installation of system, troubleshooting, and accuracy testing.

6823* An Evaluation of Isobutyl Alcohol and Its Esters. J. D. Crowley and T. E. Vance. *Paint and Varnish Production*, v. 47, Feb. 1957, p. 35-39, 99.

An isobutyl derivative may be substituted directly for the corresponding butyl derivative in lacquer formulations and in polyvinyl acetate emulsion paints. Specifications, properties, applications, and typical formulations are given.

6824* Cellulose Derivative - Solvent Interaction. W. R. Moore. *Paint and Varnish Production*, v. 47, Feb. 1957, p. 40-48.

Studies of osmotic pressure, precipitation from solution, and viscosity using cellulose nitrate, cellulose acetate, and ethyl cellulose in a variety of solvents.

6825 On Sprays and Spraying. A Survey of Spray Technology for Research and Development Engineers. I. William E. Ranz. *Pennsylvania State University, Department of Engineering Research Bulletin No.* 65, 75 p. 1956. (Tl P38b Vis.)

Characteristics of sprays. Mechanics of drops and sprays. Important variable affecting liquid break-up.

6826 (German.) Molybdenum Metallizing. **Aufgespritzte Molybdänüberzüge.** R. Machenschalk. *Planseeberichte für Pulvermetallurgie*, v. 4, Dec. 1956, p. 80-84.

A study of the application of Mo metallization to machine construction as a diversified, economical, and time saving method.

6827* (Swedish.) Correct Hard Surfacing. **Riktig hårdsvetsning.** Stig Lundin. *Svetsaren*, v. 21, no. 4, 1956, p. 63-73.

Economics of hard surfacing, choice of material, welding method used, and actual examples from various Swedish plants.

6828 Fabrication and Evaluation of Thin Clad Sheets of Molybdenum. M. H. LaChance and R. I. Jaffee. Paper from "Transactions of American Society for Metals". v. XLVIII. p. 595-626. (TS300 AM35t Vis.)

Techniques for producing thin sections of clad Mo and for edge protecting the sheared edges of the composite sheet are described. Of the cladding materials tested, Mo was best protected by the 80 wt.% Ni-20 wt.% Cr alloy.

6829 Teflon. *U. S. Department of Commerce, Office of Technical Services*, PB 121286, 1954, 43 p. (T21 Un3r Contin.)

Teflon coatings are considered suitable as a preservative for long term storage of weapons and as a lubricant for small arms in troop use. Gives properties and applications.

6830* (Russian.) Depth of Sulfurized Layer in the Sulfurization of Steel and Cast Iron. **O glubine sloia, obogashchennogo seroi pri sul'fidirovanii stali i chuguna.** G. V. Karpenko, A. N. Tynnyi, and Iu. I. Babei. *Vestnik Mashinostroeniia*, v. 37, Feb. 1957, p. 61-62.

Production of S-rich layer to improve antifriction properties.

See also: **7362** (tin coatings); **7439** (coatings for Zr); **7478** (Ni coating).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

6831* A Simple Analog Computer for Determination of the LaPlacian of a Mapped Quantity. Seymour L. Hess. *American Meteorological Society, Bulletin*, v. 38, Feb. 1957, p. 67-73.

Computer is a rapid, reproducible, sufficiently accurate means of determining the geostrophic vorticity from an analysis of the contours of an isobaric surface.

6832* Discrete Compensation of Sampled-Data and Continuous Control Systems. Eliahu I. Jury and William Schroeder. *Applications and Industry*, no. 28, Jan. 1957, p. 317-325.

Procedure for the synthesis of discrete compensation of fixed linear systems. Prescribed response is applicable to step or ramp inputs and could be extended to acceleration or higher order inputs.

6833* Hidden Oscillations in Sampled-Data Control Systems. Eliahu I. Jury. *Applications and Industry*, no. 28, Jan. 1957, p. 391-395.

The modified z-transform method is a powerful tool for detecting hidden oscillations, which the ordinary z-transform fails to indicate.

6834* Analysis of Servomechanisms With Nonlinear Feedback Control. Y. H. Ku. *Applications and Industry*, no. 28, Jan. 1957, p. 402-406.

6835* A Technique for the Analysis of Time-Varying Sampled-Data-Systems. Bernard Friedland. *Applications and Industry*, no. 28, Jan. 1957, p. 407-414.

6836* Variably Damped Servomechanisms. L. Schieber. *Applications and Industry*, no. 28, Jan. 1957, p. 414-419.

Variable damping, by allowing more efficient use of the inherent capabilities of the servo components, makes possible a considerable improvement in dynamic performance. This enables the designer to use lower amplifier gains and smaller servo motors.

6837* Response of a Particular Nonlinear Control System to Random Signals. P. N. Nikiforuk. *Applications and Industry*, no. 28, Jan. 1957, p. 419-422.

The response of an electro-mechanical control system, which incorporates by design a hard-spring amplitude characteristic, is evaluated for inputs having a Gaussian amplitude-probability distribution and no constant components.

6838* A Note on the Describing Function of an Element With Coulomb, Static, and Viscous Friction. M. Y. Silberberg. *Applications and Industry*, no. 28, Jan. 1957, p. 423-425.

Characteristic curve and torque equations. Block-diagram representation of describing function.

6839 Electroanalogical Methods. III. Solution of Problems by d-c Resistance-Network Procedures. Thomas J. Higgins. *Applied Mechanics Reviews*, v. 10, Feb. 1957, p. 49-54.

6840* Developing Large Scale Automation. P. H. Alspach. *Automation*, v. 4, Mar. 1957, p. 67-72.

A successful approach must be based upon careful consideration of all the functions involved in a business; marketing, engineering, manufacturing, finance, and personnel.

6841 Coding Tool for Translator Cards. E. Graf. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 53-56.

Information necessary for automatic telephone switching equipment is supplied in the form of sheet-steel blanks perforated by an operator using a card-coding tool.

6842* The Use of an Analogue Computer in Control System Analysis. J. G. Miles and W. G. Proctor. *British Communications and Electronics*, v. 4, Feb. 1957, p. 86-90.

Application to problems associated with the design of industrial control and regulating systems in a large electrical manufacturing organization.

6843* The Design and Applications of a General-Purpose Analogue Computer. R. J. A. Paul and E. Lloyd Thomas. *British Institution of Radio Engineers, Journal*, v. 17, Jan. 1957, p. 49-73.

6844* New Computer Developments Around the World. Everett S. Calhoun. *Computers and Automation*, v. 6, Feb. 1957, p. 10-13, 54.

6845* The Solution of Boundary Value Problems on a Reac Analog Computer. M. Yanowitch. *Computers and Automation*, v. 6, Feb. 1957, p. 26-29, 39.

Procedure is illustrated by application to analysis of vibrations in beams.

6846 Are High Performance and Low Cost Compatible in Hydraulic Servos? John G. Chubbuck. *Control Engineering*, v. 4, Mar. 1957, p. 98-103.

It's possible to achieve high performance from an inexpensive servo by using forcefully accelerated switching signals.

6847 Pulse Synchronizing for High-Gain Servomechanisms. G. H. Friedman and M. Schwartz. *Control Engineering*, v. 4, Mar. 1957, p. 104-106.

Unusual circuit produces a decelerating pulse as the system approaches zero error, thus allowing the system to synchronize to its reference input at the maximum speed without overshoot.

6848 Digital Differential Analyzers. George F. Forbes. 3rd Ed. 185 p. 1956. George F. Forbes, Pacoima, Calif. (QA85 F74d)

An applications manual for digital and Bush type differential analyzers.

6849 Systems Engineering, a Growing Concept. E. W. Engstrom. *Electrical Engineering*, v. 76, Feb. 1957, p. 113-116.

Evolution and characteristics. Application to the engineering of a color TV system and a specific weapons system.

6850 Electronic Analog Computers. (D-C Analog Computers). Granino A. Korn and Theresa M. Korn. 2nd Ed. 452 p. 1956. McGraw-Hill, New York. (QA76 K84e2)

A comprehensive treatment of d-c analog computers, used as differential analyzers, equation solvers, simulators, and control system components. Design information covering circuit theory, components, and complete systems.

6851 An Accumulator Unit for a Dekatron Calculator. R. Townsend and K. Camm. *Electronic Engineering*, v. 29, Feb. 1957, p. 58-64.

At the expense of five hard valves, one cold-cathode trigger tube and a Dekatron per stage, this accumulator can add, substract, multiply, or divide by ten in a basic time of 550μ sec.

6852 The Junction Transistor as a Computing Element. E. Wolfendale, L. P. Morgan, and W. L. Stephenson. *Electronic Engineering*, v. 29, Feb. 1957, p. 83-87.

Design and performance of an asymmetrical bistable circuit, blocking oscillators, and logical gates. (To be continued.)

6853 Basic Logic Circuits for Computer Applications. G. W. Booth and T. P. Bothwell. *Electronics*, v. 30, Mar. 1, 1957, p. 196-200.

Digital computer circuits, including flip-flop, gated pulse amplifier, power amplifier and indicator, use H.F. junction transistors to obtain high reliability and performance characteristics.

6854* Machine Loading—An Industrial Application of Computers. C. M. Berners-Lee. *Engineer*, v. 203, Feb. 1, 1957, p. 169-171.

Use of computer for scheduling production in a general machine shop.

6855 Information Theory and Its Engineering Applications. D. A. Bell. 2nd Ed. 174 p. 1956. Isaac Pitman & Sons, Ltd., London. (TK5101 B41i2)

An account of recent developments, requiring only a knowledge of mathematics that migh be reasonably expected of a professional engineer or physicist.

6856 System Theory as an Extension of Circuit Theory. William K. Linvill. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 217-223. (TK1 In6.6c Vis.)

Applies system analysis techniques to the study of convergence of iterative methods for solving equations.

6857 The Use of Least Squares in System Design. M. Robert Aaron. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 224-231. (TK1 In6.6c Vis.)

6858 Systems Analysis of Discrete Markov Processes. R. W. Sittler. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 257-266. (TK1 In6.6c Vis.)

Relates the above to analogous linear, time-invariant, sampled-data systems.

6859 Ladder Network Analysis by Signal-Flow Graph—Application to Analog Computer Programming. Omar Wing. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 289-294. (TK1 In6.6c Vis.)

Construction of a flow graph by inspection and analysis of the network from the graph.

6860 Electronic Counting. XVI. Digital Automation. Martin L. Klein, Frank K. Williams, and Harry G. Morgan. *Instruments and Automation*, v. 30, Feb. 1957, p. 242-248.

Various flexible modes of counting are now available, including binary, decade, preset, grated carry, digital, events-per-unit-time, analog time, and ring counting.

6861 General-Purpose Integrator for Data Reduction. Harry Stern. *Instruments and Automation*, v. 30, Feb. 1957, p. 254-255.

New instrument accepts analog voltage signals, converts to digits by heterodyne technique, and then counts or integrates area under signal curve. Input signal changes frequency of 100 kc. reactance oscillator by 10 kc. giving count rate of 10,000 counts per sec.

6862 Basic Analysis Methods for Nonlinear Control Systems. T. M. Stout. *Instruments and Automation*, v. 30, Feb. 1957, p. 262-267.

The phase-plane method deals primarily with transient conditions, while the describing-function method is concerned with steady-state oscillatory conditions.

6863* Computers for Business and Management. Eugene M. Grabbe. *ISA Journal*, v. 4, Feb. 1957, p. 62-65.

Trends in electronic data-processing developments; general purpose computers for business; and business-computer applications.

6864* The Logic of V-Brush Analog-to-Digital Converters. S. K. Feingold. *ISA Journal*, v. 4, Feb. 1957, p. 66-68.

A clear explanation of how the dual-brush reader produces truly non-ambiguous conversion to a binary code.

6865 Hydraulic Servos. I. J. M. Nightingale. *Machine Design*, v. 29, Feb. 21, 1957, p. 109-113.

Practical methods for analyzing typical systems.

6866 National Simulation Conference, Proceedings. Sections individually paged. 1956. Department of Electrical Engineering, Southern Methodist University, Dallas. (QA76 N21p)

Papers on various aspects of simulation of mechanical and electrical systems. Applications to missiles and other equipment.

6867 Give Your Problems to the Computer. Bartow Hodge. *Petroleum Refiner*, v. 36, Feb. 1957, p. 102-105.

Describes how problems are prepared for the computer and how to organize personnel to handle computer operations.

6868 Tomorrow—Automatic Programming. Grace Murray Hopper. *Petroleum Refiner*, v. 36, Feb. 1957, p. 109-112.

The future of digital computers reveals great advances in the field of automatic coding.

6869* (Spanish.) Frequency Memory Devices. **Memorias de frecuencias.** L. R. de Gopegui. *Revista de Ciencia Aplicada*, v. 10, Nov.-Dec. 1956, p. 502-513.

Description of some memory devices of the recirculatory, oscillatory, or quartz crystal types. Application to elementary arithmetic operations.

6870 Card-Programmed Control for Reversing Mills. Andrew W. Smith. *Westinghouse Engineer*, v. 7, Mar. 1957, p. 40-41.

System makes reversing roughing mill completely automatic.

6871 Feedback Control Principles for Industrial Drives. C. G. Helmick. *Westinghouse Engineer*, v. 7, Mar. 1957, p. 42-46.

See also: **6536** (automatic weighing); **6537** (process control systems); **6975** (applications of ferrites); **7269** (hydraulic controls); **7338** (automatic control of open-hearth furnace); **7576** (data handling for nuclear power tests); **7604** (computer bibliography); **7607** (computer applications in offices); **7608** (office automation); **7659** (computers calculate heat transfer).

ELECTRICAL ENGINEERING

6872 Measurement of High Resistance. S. W. Leifson. *American Journal of Physics*, v. 25, Feb. 1957, p. 89-92.

Using an inverted triode voltmeter, complete data for plotting the charge and discharge curves of a condenser may be obtained in a few minutes.

6873* (German.) Effect of Primary Copper on the Properties of a Cuprous Oxide Rectifier. **Einfluss des Ausgangskupfers auf die Eigenschaften von Kupferoxydulgleichrichtern.** F.

Eckart and C. Fritzsche. *Annalen der Physik*, v. 19, nos. 1-2, 1956. p. 19-30.

Utilization of aged Cu_2O rectifiers, their properties, and comparison with CCC-Cu (Chile-Cu) rectifiers.

6874* Transient Characteristics of D-C Metal-Rolling Motors and Generators. Edward P. Smith. *Applications and Industry*, no. 28, Jan. 1957, p. 326-331.

6875* Centralized Control of Power Systems in the Steel Industry. W. A. Derr and W. L. Metz. *Applications and Industry*, no. 28, Jan. 1957, p. 332-339.

Because of the concentration of substations in a relatively small area, telephone-type cable circuits are usually employed to provide the necessary channels for centralized control.

6876* Electric Power Systems for Steel Plants. H. N. Cox and L. G. Levoy. *Applications and Industry*, no. 28, Jan. 1957, p. 339-349.

General requirements; plant layout; electric energy generation and consumption; d.c. systems; cable selection.

6877* Voltage Dips and Flicker. A. A. Kroneberg. *Applications and Industry*, no. 28, Jan. 1957, p. 349-352.

Limits of tolerance; causes; prevention and cure.

6878* A Pressure Control Switch With a Pulsation Filter. L. P. Schaefer. *Applications and Industry*, no. 28, Jan. 1957, p. 426-432.

Switch uses viscous damping to prevent the transmission of pressure pulsations from a pump outlet system to the pressure control system.

6879 First Transatlantic Telephone Cable System. E. T. Mottram. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 41-47.

Details of the entire cable laying project.

6880 Relay Contact Life in Central Offices. A. P. Goetze. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 65-68.

Erosion characteristics of various contact metals are being studied and evaluated to provide data from which contacts can be engineered for adequate life and a high degree of reliability.

6881 Equalization of Military Carrier Telephone Systems. C. L. Semmelman. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 73-75.

Excellent equalization was achieved by the use of a combination of fixed and adjustable equalizers and temperature-compensating regulators.

6882 Transatlantic Telephone Cable System—Planning and Over-All Performance. E. T. Mottram, R. J. Halsey, J. W. Emling, and R. G. Griffith. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 7-27.

6883 Repeater Design for the North Atlantic Link. T. F. Gleichmann, A. H. Lince, M. C. Wooley, and F. J. Braga. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 69-101.

Design of flexible repeaters and amplifiers for the Atlantic telephone cable.

6884 Repeater Production for the North Atlantic Link. H. A. Lamb and W. W. Heffner. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 103-138.

Production of submarine telephone cable repeaters, designed to have a minimum trouble-free life of 20 yrs., required many new and refined manufacturing procedures.

6885 Power Feed Equipment for the North Atlantic Link. G. W. Meszaros and H. H. Spencer. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 139-162.

Submarine cable design features.

6886 Cable Design and Manufacture for the Transatlantic Submarine Cable System. A. W. Lebert, H. B. Fischer, and M. C. Biskeborn. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 189-216.

6887 System Design for the Newfoundland-Nova Scotia Link. R. J. Halsey and J. F. Bampton. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 217-244.

Route, equipment, transmission system, and maintenance facilities.

6888 Repeater Design for the Newfoundland-Nova Scotia Link. R. A. Brockbank, D. C. Walker, and V. G. Welsby. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 245-276.

Each repeater has a gain of 60 db. at 552 kc., and the amplifier consists of two forward amplifying paths with a common feedback network.

6889 Route Selection and Cable Laying for the Transatlantic Cable System. J. S. Jack, W. H. Leech, and H. A. Lewis. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 293-326.

6890* The Circuit Development of a Heavy-Duty Dynamic Balancing Machine. L. H. Vale. *British Institution of Radio Engineers, Journal*, v. 17, Jan. 1957, p. 15-32.

Equipment operation depends largely on the performance of a pulse forming circuit required to function at very L.F.

6891 Multi-Cell Inert Dry Batteries. R. E. Bauer. *Commonwealth of Australia, Dept. of Supply, Defence Standards Laboratories Report* 226, Oct. 1956, 17 p. (T1 Au78.2r Vis.)

Shelf life limitations are overcome by assembling batteries of dehydrated cells to which water has to be added prior to use, and a special method of assembly and equipment for activation.

6892 A Method of Compensating Loading Errors in Double-Ended Potentiometers. Jules Sandock. *Control Engineering*, v. 4, Mar. 1957, p. 109-111.

Loading error can be considerably reduced by a slight increase in the reference voltage.

6893* Direct-Writing Oscillographs Record Faults Instantaneously. Joseph L. Koepfinger. *Electric Light and Power*, v. 35, Feb. 15, 1957, p. 97-98, 100,106.

Graphic type instrument records full change in magnitude of currents and voltages during system disturbances.

6894* Operating Experiences With Pilot Wire Relays. K. R. Anderson. *Electric Light and Power*, v. 35, Feb. 15, 1957, p. 108-111.

Three cases show what happens on false trip; how to use relays not normally used on pilot wires; and induced voltage trouble.

6895* High-Volume Etching Method for Printed-Circuit Boards. E. F. Ottens. *Electronic Equipment*, v. 5, Feb. 1957, p. 24-25.

Machine uses ferric chloride to make letter-perfect circuits for a wide variety of applications.

6896* Solenoids for Airborne Applications. A. S. Gutman. *Electronics & Radio Engineer*, v. 34, Feb. 1957, p. 42-45.

Design is influenced by considerations of weight. A formula is derived for the optimum dimensions of a single-turn solenoid, taking account of its own weight and that of associated power-generating equipment. A wafer-type layer-wound coil is preferred to an edge-wound type.

6897* (Czech.) Transformer for High Outputs and Very High Voltages. **Transformátory velkých výkonů a velmi vysokých napětí.** Václav Vöchoč. *Elektrotechnický Obzor*, v. 46, Jan. 1957, p. 2-8.

Describes various designs of the magnetic circuit and various winding arrangements for 400 kv. transformers.

6898* (Czech.) About the Calculation of the Supplementary Magnetomotive Force for the Compensation of the Rotor Reaction in D. C. Machines. **K otázce výpočtu přídavné magnetomotorické síly pro kompensaci reakce kotvy u stejnosměrných strojů.** Minčo Zlatev and Ivan Popov. *Elektrotechnický Obzor*, v. 46, Jan. 1957, p. 16-17.

6899 Electromagnetic Radiation From Lightning Strokes. E. L. Hill. *Franklin Institute, Journal*, v. 263, Feb. 1957, p. 107-119.

A theory is given of the spectral distribution and the absolute amount of L.F. electromagnetic radiation emitted by a vertical lightning stroke from cloud to ground. The radiated energy has a maximum intensity at about 11 kc. per sec. and a total width at half-maximum of 12 kc. per sec.

6900* A Uniform Light Source Excited by Radio Frequency. Sanford C. Peek. *Illuminating Engineering*, v. 52, Feb. 1957, p. 96-102.

Discusses developments and applications of this new small light source.

6901 The Application of Large Capacitors for Use in Energy Storage Banks. Douglas F. Warner. *Institute of Radio Engineers, Transactions on Component Parts,* v. CP-3, Dec. 1956, p. 81-88. (TK1 In6.6cp Contin.)

Refers to the various special characteristics required of capacitors and how they affect the cost, mechanical configuration, circuitry, and protection requirements.

6902 Miniaturized High-Altitude, High-Temperature Connectors. C. H. Stuart and R. F. Dorrell. *Institute of Radio Engineers, Transactions on Component Parts,* v. CP-3, Dec. 1956, p. 105-109. (TK1 In6.6cp Contin.)

At altitudes in the order of 70,000 ft. and temperatures of −85 F, the connectors permit operation at 500 v. at 60 or 400 c.p.s. and withstand test voltages of 1000 v. at 60 c.p.s.

6903 Reliable Precision Wirewound Resistor Design. James S. Galbraith. *Institute of Radio Engineers, Transactions on Component Parts,* v. CP-3, Dec. 1956, p. 116-119. (TK1 In6.6cp Contin.)

Comparison of old and new resistors; the new precision resistor design.

6904 Multipurpose Evaporated Metal Film Resistors. Sidney J. Stein. *Institute of Radio Engineers, Transactions on Component Parts,* v. CP-3, Dec. 1956, p. 119-124. (TK1 In6.6cp Contin.)

Offer potential advantages when used for miniaturization or airborne equipment. Performance characteristics.

6905* Power Station Auxiliary Plant. Geoffrey F. Kennedy and F. J. Hutchinson. *Institution of Mechanical Engineers, Proceedings,* v. 170, no. 11, 1956, p. 341-387 + 2 plates.

Problems of the planning stage.

6906* Corona and Its Effect on Insulation—A Résumé. I. T. W. Liao. *Insulation,* v. 3, Mar. 1957, p. 18-21.

A review of phenomena, their causes and effects. (To be concluded.)

6907 High Interrupting Capacity Controllers for 2300-4600 Volt Motors. Charles A. Lister. *Iron and Steel Engineer,* v. 34, Feb. 1957, p. 132-139.

Both air-break and oil-immersed motor controllers of high-interrupting capacity are now available. Depending upon the application, they take many different forms, but have in common the ability to do the regular duties well and to stand up under the severe abnormal conditions of short-circuits.

6908 Electrostatic Considerations in $BaTiO_3$ Domain Formation During Polarization Reversal. Rolf Landauer. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 227-234.

Merz's picture of spike-shaped domains of reversed polarization emerging from an electrode is analyzed with particular attention to its electrostatic aspects, taking into account the inhomogeneous piezoelectric distortions which accompany domain formation. The depolarization energy of a domain is evaluated.

6909 Stereo-Micrographs of Conductivity. Ludwig Mayer. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 259-262.

A three-dimensional display of the conductivity distribution of this films is possible by combining two electron mirror micrographs to a stereo-pair. The two micrographs are distinguished solely by the amount of current passing through the specimen.

6910* Structure and Phase Transitions of Ferroelectric Sodium-Lead Niobates and of Other Sodium Niobate Type Ceramics. M. H. Francombe and B. Lewis. *Journal of Electronics,* v. 2, ser. 1, Jan. 1957, p. 387-403.

6911* Applications of the Mercury Jet Switch. William R. Davis. *Refrigerating Engineering,* v. 65, Feb. 1957, p. 35-41, 76.

May serve as a high-repetition-rate-pulse generator capable of creating pulses with 2-mμ. sec. rise times.

6912 Generation of Static on Solid Insulators. P. S. H. Henry. *Textile Institute, Journal (Proceedings),* v. 48, Jan. 1957, p. P5-P25.

Nature of charge carriers; equilibrium and kinetic processes; model for predicting basic processes.

6913* (German.) Material Transfer While Breaking a Direct Current With Electric Contacts. **Über die Materialwanderung an elektrischen Unterbrecherkontakten.** Albert Keil and Wilhelm Merl. *Zeitschrift für Metallkunde,* v. 48, Jan. 1957, p. 16-25.

Examples of arc transfer at W contacts and some Ag alloy contacts; three different mechanisms of material transfer.

6914* (Russian.) The Physical Condition for Corona Discharge on a Smooth Conductor at a Fixed Potential. **Fizicheskie usloviia vozniknoveniia koronnogo rasriada na gladkikh provodakh pri postoiannom napriazhenii.** G. N. Aleksandrov. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, Dec. 1956, p. 2640-2651.

Application of the L. Loeb theory for the particular case of smooth conductors.

See also: **6497** (properties of $BaO \cdot TiO_2$ and $PbO \cdot TiO_2$); **6508** (electric strength of glass); **6509** (electrical properties of glass); **6517** (high-tension porcelain); **7167** (electric motors for oilfield drilling equipment); **7219** (steam-electric power plant); **7319** (corrosion of high voltage cables); **7706** (use of thermoplastic materials); **7749** (selection of electric motors); **7750** (electric heating in homes).

ELECTROCHEMISTRY

6915* Materials Used in Radio and Electronic Engineering. V. The Electrodeposition of Metals. *British Institution of Radio Engineers, Journal,* v. 17, Jan. 1957, p. 35-47.

Uses of electroplated coatings; preparation of basis metal; electrodeposited finishes; treatment after plating; methods of testing; specifications.

6916 Electrochemical Studies of Non-Aqueous Melts. R. F. Mehl and G. Derge. *Carnegie Institute of Technology, Metals Research Laboratory (U. S. Atomic Energy Commission),* NYO-6623 and NYO-6621, June 1956 and Jan. 1957, 8 and 8 p. (UF767 Un3ny Contin.)

Conductivity of molten Cu_2S under controlled H_2/H_2S atmospheres; self-diffusion of Fe in molten FeS; constitution of $MnO\text{-}FeO\text{-}SiO_2$ slags.

6917* (English.) **Electrodeposition From Sulphamate Solutions. III. Nickel-Zinc Alloys.** S. Sathyanarayana and T. L. Rama Char. *Electrochemical Society, Bulletin of India Section,* v. 5, Oct. 1956, p. 83-85.

At 100% cathode efficiency the Ni content in the alloy deposit is very low. It may be greatly increased at the sacrifice of efficiency.

6918 Metallographic Study of Electroplated Coatings of Chromium and Nickel on Molybdenum. Roger J. Runck. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 74-79.

In single-layer coatings, Cr was less subject to bonding failure than Ni and afforded better protection against oxidation. Cracking of Cr coatings was probably a major cause of failure, but good protection was possible if a layer of Cr-Mo alloy was developed at the interface. Undesirable features of electroplated Cr may be somewhat overcome by covering it with a layer of Ni.

6919 Electrodeposition of Uranium at the Microgram Level. Charles L. Rulfs, Anil K. De, and Philip J. Elving. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 80-83.

Optimum results were obtained in an ammonium oxalate medium with electrolysis at 80-85 C being performed first in acidic solution and then in alkaline solution. A small Pt disk which fitted into a flow counter was used as cathode, and a Pt spiral served as anode.

6920 An Improvement for the Electrolytic Preparation of Aminoguanidine. Motoji Yamashita and Kiichiro Sugino. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 100-104.

A yield of 80% aminoguanidine was obtained by reducing nitroguanidine in 30% $(NH_4)_2SO_4$ solution at Pb, Zn, and Fe cathodes using 3-10 amp. per $dm.^2$ at a temperature of about 10 C.

6921 Electrochemical Properties of a Cation-Transfer Membrane. N. W. Rosenberg, J. H. B. Goerge, and W. D. Potter. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 111-115.

Ionic mobilities are lower in the membrane than in free solution, indicating a high degree of association between the cations and the charge centers of the membrane.

6922 Kinetics of Metal Deposition. Polarography Using Stationary Microelectrodes. T. Pavlopoulos and J. D. H. Strickland. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 116-123.

Derivation of an equation for current densities in systems containing excess inert electrolyte.

6923 Preparation and Reproducibility of the Thermal-Electrolytic Silver-Silver Chloride Electrode. Harry Taniguchi and George J. Janz. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 123-127.

6924 Current Distribution in Galvanic Cells Involving Natural Convection. Carl Wagner. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 129-131.

From equations for mass transfer due to natural convection in a laminar boundary layer, it is derived that, in electrolytic cells used for the refining of metals such as Cu, the current density is virtually constant, although concentration polarization at both the cathode and the anode varies from bottom to top.

6925 Electrolytic Titanium. R. S. Dean, editor. 35 p. 1957. Chicago Development Corp., Riverdale, Md. (TN799.T5 C43e)

Progress report on electrorefining studies, with details on apparatus, electrolytes, operating conditions, and yields.

6926 The Effect of Certain Constituents of Tank Linings on Nickel Electrodeposits. An Investigation Covering Rubber and Plastic Materials. J. Edwards. *Electroplating and Metal Finishing*, v. 10, Feb. 1957, p. 41-43.

Tests on a number of rubber accelerators and anti-oxidants showed that only tetramethyl-thiuram disulfide (accelerator) and acetone-aniline (anti-oxidant) were without deleterious effect on electrodeposits from a Watts-type dull Ni plating solution and from two proprietary organic bright nickels.

6927* (German.) Periodic Current Intensity Variations During the Anodic Decomposition of Zinc. **Über periodische Stromstärkeschwankungen bei der anodischen Auflösung des Zinks. I.** K. Schwabe. *Metalloberfläche*, v. 11, Jan. 1957, p. 1-6.

Study of surface layer passivity and periodic phenomena taking place in various Zn salts and electrolytes. Applications to electrolytic polishing.

6928* (German.) A New Apparatus for Determination of Sulphuric Acid in Chromium Baths. **Neue Apparatur zur Bestimmung von Schwefelsäure in Chrombädern.** B. Lovreček and K. Bošnjak. *Metalloberfläche*, v. 11, Jan. 1957, p. 19-20.

Instrument is simple, accurate, and practical.

6929 Processes and Techniques for Achieving Extreme Surface Hardness and Wear Resistance. Frank J. Rizzo. *Metal Treating*, v. 8, Jan.-Feb. 1957, p. 8-9, 33.

Hard, highly ductile Cr plate deposits can now be placed directly upon Al, Ti, cold-rolled steels, Pb and Zn alloys, tungsten carbide, and Be-Cu alloys.

6930* How to Color Anodized Aluminum. B. M. Phelan. *Modern Metals*, v. 13, Feb. 1957, p. 35-36, 38-39.

Coloring characteristics of alumilite, chromic acid, and oxalic acid processes, with pretreatment and process steps for each.

6931 Effects of Impurities in Cyanide Plating Solutions. H. L. Benner and R. R. Bair. *Plating*, v. 44, Feb. 1957, p. 151-155.

Selection of suitable tank linings. Prevention of contamination in solutions of cyanide Zn, bright Zn, Cu, Cd, Ag, and brass.

6932 Anodized Aluminum for Automobile Trim Parts. C. F. Nixon and H. A. Kahler. *Plating*, v. 44, Feb. 1957, p. 156-160.

Advantages of anodized Al and anodizing operations.

6933 The Economics of Treatment of Strong Chromic Acid Solutions. George E. Glover. *Plating*, v. 44, Feb. 1957, p. 161-165.

The economic significance of such factors as total contaminant metal build-up rate; maximum metal concentration permissible in the plating bath; maximum amount of water the plating bath can accept each day; local regulations regarding discharge of industrial wastes.

6934 Effects of Impurities and Purification of Electroplating Solutions. I. Nickel Solutions. II. The Effect and Removal of Calcium. A. J. Smith and Ralph Bacon. *Plating*, v. 44, Feb. 1957, p. 186-187.

Calcium in solution did not affect appearance, ductility, throwing power, hardness adhesion, or corrosion resistance. No method for removing Ca was found.

6935 Preparation of High-Purity Electrolytic Chromium. P. M. Gruzensky and F. E. Block. *U. S. Bureau of Mines, Report of Investigations* 5305, Jan. 1957, 11 p. (TN21 Un3r)

Chromium prepared by electrodeposition from chromic-acid solutions is pure enough for fabrication into cold ductile shapes without further purification.

6936 Wire Plated Before Drawing by Novel Spiral Process. Orville E. Adler. *Wire and Wire Products*, v. 32, Feb. 1957, p. 168-169, 217.

Improvements in the Kenmore process of plating have produced coatings that may be controlled as to thickness and that are exceptionally adherent and able to withstand severe drawing and forming.

See also: **6980** (Rh electrodeposits); **7240** (storage battery analyzer); **7330** (salt spray testing of electroplate); **7397** (properties of Cr electrodeposits); **7399** (fatigue of Cu electrodeposits); **7480** (epitaxy of electrodeposits).

ELECTRONICS

6937 Disk-Loaded Torsional Wave Delay Line. I. Construction and Test. P. Andreatch, Jr. and R. N. Thurston. **II. Theoretical Interpretation of Results and Design Information.** R. N. Thurston. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 16-25.

6938 A Method for Reducing Time Jitter in the Output of a Single Channel Analyzer. G. W. Eakins, B. J. Loupee, W. A. Rhinehart, G. Schupp, and E. N. Jensen. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-804, Dec. 1956, 18 p. (UF767 Un3.1is Contin.)

Enables coincidence studies to be conducted which result in an approximate sixfold increase in the true-to-accidental coincidence ratio.

6939* (French.) Action of an Input Voltage Having a Sawtooth Variation on a Radio Receiver. **Action sur un récepteur radioélectrique d'une tension d'entrée dont la fréquence instantanée varie en dents descie.** Paul Poincelot. *Annales des Télécommunications*, v. 11, Dec. 1956, p. 262-266.

Analysis of circuits subjected to a voltage varying according to a fixed law.

6940* (French.) Some Problems Raised by the Propagation of 8 mm. and 3 cm. Waves, Above the Sea and Through Rain. **Quelques problèmes posés par la propagation des ondes de 8 mm. et de 3 cm., au-dessus de la mer et a travers la pluie.** David G. Kiely. *Annales des Télécommunications*, v. 11, Dec. 1956, p. 267-279.

Experimental study of fading and frequency variation at various times of the yr.

6941* (French.) Calculation of a Current Along a Cylindrical Antenna. **Calcul du courant de long d'une antenne cylindrique.** Roland Dematte. *Annales des Télécommunications*, v. 11, Dec. 1956, p. 280-287.

6942* Feedback Techniques Applied to the Single-Phase Transformer. E. Mishkin. *Applications and Industry*, no. 28, Jan. 1957, p. 374-378.

6943* A Step-by-Step Method for Transient Analysis of Feedback Systems With One Nonlinear Element. T. M. Stout. *Applications and Industry*, no. 28, Jan. 1957, p. 378-390.

6944* Tweeter Design Considerations. George W. Sioles. *Audio Engineering Society, Journal*, v. 4, July 1956, p. 105-109.

The distinguishing features of loudspeaker are its high efficiency and high output-power capabilities. It can be designed with an efficiency of 20 to 30% and with acoustic output in excess of 1 w.

6945* Free-Field Technique for Secondary Standard Calibration of Microphones. Arnold L. Seligson. *Audio Engineering Society, Journal*, v. 4, July 1956, p. 110-115.

By use of an automatic volume control system in conjunction with two standard microphones, the free-field calibration of microphones is substantially accelerated and improved in accuracy.

6946* How to Use the Unijunction Transistor. Richard A. Stasior. *Automatic Control*, v. 6, Feb. 1957, p. 24-25.

The Si unijunction transistor has characteristics resembling a neon light: it can be wired to a capacitor and a resistor to yield an oscillator. However, it has frequency and power capabilities useful for control circuits.

6947* Circuits for Switching and Control. C. D. Simmons and C. I. Swanson. *Automatic Control*, v. 6, Feb. 1957, p. 29-31.

Direct coupled circuits may use fewer resistors than transistors and only one supply voltage. Technique is simple; advantages are numerous.

6948 The Tone Ringer. F. L. Crutchfield and J. R. Power. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 48-52.

A transistor-operated tone ringer was designed, as a possible replacement for the conventional telephone bell to provide equal or superior performance in supplying a pleasant but attention-attracting sound.

6949 Radio Communication in Railroad Tunnels. H. S. Winbigler. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 57-60.

Tests with moving trains resulted in the concept of radiation from a continuous transmission line along the tunnel instead of from separate antennas.

6950 Field Test Set for "Packaged" Amplifiers. J. W. Balde. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 61-64.

A new universal test set and a plug-in adapter designed to test each type of package makes it possible for a single test set to do the work which formerly required several.

6951 Carrier-Frequency Transformers for Pl Carrier. Doris Ribett. *Bell Laboratories Record*, v. 35, Feb. 1957, p. 69-71.

Transformers handle frequencies in the band between 8 and 100 kc.; their use in the Pl system makes it possible to add 4 two-way conversations to the existing voice frequency over a single pair of wires.

6952 Electron Tubes for the Transatlantic Cable System. J. O. McNally, G. H. Metson, E. A. Veazie, and M. F. Holmes. *Bell System Technical Journal*, v. 36, Jan. 1957, p. 163-188.

Repeater and tube design; development problems and features introduced to eliminate potential difficulties. Electrical characteristics and life test data.

6953* Some Characteristics of Long-Distance Scatter Transmissions. I. Transmission Via Ionospheric Scatter. F. A. Kitchen and I. J. Richmond. *British Communications & Electronics*, v. 4, Feb. 1957, p. 74-78.

Scattering mechanism; characteristics of ionospheric scatter propagation; recent investigations. (To be continued.)

6954* A Low-Noise Travelling-Wave Tube Amplifier for the 4000-Mc's Communications Band. D. H. O. Allen and J. M. Winwood. *British Institution of Radio Engineers, Journal*, v. 17, Jan. 1957, p. 75-85.

Design and performance details.

6955* Principles of Single Sideband (SSB). *Bureau of Ships Journal*, v. 5, Mar. 1957, p. 30-33.

Recent developments have given a new impetus to the advantages of applying SSB to fleet communications.

6956* A Command Set Six Meter Transceiver. Donald L. Stoner. *CQ Radio Amateurs' Journal*, v. 13, Mar. 1957, p. 65-69, 106, 108.

Circuits; part list; operating details.

6957* (Russian.) The Mechanism of Scattering of Carriers in Lead Telluride. **O mekhanizme rasseianiia nositelei v telluristom svintse.** L. S. Stil'bans, B. I. Bok, and E. L. Lifshits. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 11, 1956, p. 1011-1013.

6958* (Russian.) A Pulse Method of Studying the Photoelectric Properties of the p-n Junction in Germanium. **Impul'snyi metod issledovaniia fotoelektricheskikh svoistv p-n perekhoda v germannii.** Iu. I. Ukhanov. *Doklady Akademii Nauk, SSSR*, v. 111, Dec. 21, 1956, p. 1238-1241.

Study of absorption and modulation of infra-red rays.

6959 First Principles of Semiconductors. C. A. Escoffery. *Electrical Engineering*, v. 76, Feb. 1957, p. 142-147.

A brief review of semiconductors phenomena which has been stripped of the jargon of the physicist.

6960 Influence of Impurities on the Photoconductance of Zinc Oxide. Harold A. Papazian, Paul A. Flinn, and Dan Trivich. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 84-92.

When irradiated by light, ZnO undergoes a "memory mechanism" which depends on the past irradiation history, and is caused by formation of traps independent of charge carrier formation. The concentration of traps is a function of impurity concentration and temperature.

6961* Vibration Tube Testing. Lewis B. Martin. *Electronic Design*, v. 5, Feb. 1, 1957, p. 28-31.

The four basic steps in testing for reducing tube microphonics are: creating the mechanical vibration, observing the electrical noise, locating sources of tube microphonics, and eliminating excessive tube resonances.

6962* Automatic Interpolation With Spiral-Scale Dials. Christian D. Berger. *Electronic Design*, v. 5, Feb. 1, 1957, p. 38-41.

Operating principles and design equations for dials on measuring instruments having non-linear characteristics.

6963* Radiation Absorbers—Their Selection and Use. Donald J. Newman. *Electronic Design*, v. 5, Feb. 1, 1957, p. 44-47.

Characteristics of available absorbing materials; methods of selecting; application to the walls of measurement chambers.

6964* RF and IF Amplifier Design With Conductance Curves. Keats A. Pullen, Jr. *Electronic Design*, v. 5, Feb. 1, 1957, p. 48-51.

Recommended tube operating conditions, and their associated circuit parameters. Suggestions for chassis layout, socket orientation, and electrical grounding.

6965 A Valve-Voltmeter for Synchro Testing. D. L. Davies. *Electronic Engineering*, v. 29, Feb. 1957, p. 52-57.

Consists of a phase-conscious meter, and phase-shifter, for accurate detection of a null in the reference component of the test signal; an accurate wide-band valve-voltmeter for measurement of total residual signal; and a selective amplifier to separate quadrature fundamental from the harmonics and noise.

6966 Heat Control in Electronic Equipment. II. E. N. Shaw. *Electronic Engineering*, v. 29, Feb. 1957, p. 65-70 + 2 plates.

Determination of isothermal patterns for various types of rack assemblies. Design factors. (To be continued.)

6967 The Characteristics of Parallel-T RC Networks. D. H. Smith. *Electronic Engineering*, v. 29, Feb. 1957, p. 71-77.

6968 A Multiple-Channel Oscilloscope for Electrophysiology. P. E. K. Donaldson. *Electronic Engineering*, v. 29, Feb. 1957, p. 78-83.

For a multiple-trace cathode-ray tube display of four beams or more there are important economic and theoretical advantages in using the voltage-coincidence type of oscilloscope.

6969 A Stable F. M. Receiver With Preset Tuning. G. S. Robinson. *Electronic Engineering*, v. 29, Feb. 1957, p. 88-91.

Physical and electrical arrangements, with special reference to the use of a crystal-controlled local oscillator. Construction and performance of components.

6970* Socket Design for a Ceramic Triode. Carlton P. Werner. *Electronic Equipment*, v. 5, Feb. 1957, p. 18-21.

High-temperature tolerance and low-space needs characterize new triode unit.

6971* Industrial Design in Electronics. A Case History. Robert H. Hose. *Electronic Equipment*, v. 5, Feb. 1957, p. 26-29.

An example of design considerations basic to an efficient working relationship between man and machine.

6972* Single-Sideband Design for Low-Power Operation. Niles L. Barlow. *Electronic Equipment*, v. 5, Feb. 1957, p. 30-33.

6973* Designing Transistor Circuits. How to Temperature-Stabilize Bias. Richard B. Hurley. *Electronic Equipment*, v. 5, Feb. 1957, p. 34-39.

Deals with the nature of temperature-produced bias disturbances, stabilization of individual stages, interactions among direct-coupled stages, and considerations applicable to the design of improved d.c. amplifiers.

6974* Non-Linear Circuit Equation. J. Irving and N. Mullineux. *Electronic & Radio Engineer*, v. 34, Feb. 1957, p. 53-55.

A perturbation method of solving non-linear equations. A numerical method is employed as a check.

6975* Progress in Ferrite Materials. Computer and Microwave Applications. *Electronic & Radio Engineer*, v. 34, Feb. 1957, p. 56-61.

6976* Network Matching Problems. John Deignan. *Electronic & Radio Engineer*, v. 34, Feb. 1957, p. 70-73.

A simple graphical method of solving problems involving impedances in parallel, and examples illustrating its application to typical problems.

6977 Beacon Antennas for Guided Missiles. W. E. Barrick and D. L. Brannon. *Electronics*, v. 30, Mar. 1, 1957, p. 166-168.

S-band and X-band antenna arrays consisting of three elements, equally spaced and circumferentially mounted on the missile, are fed in phase with polarization parallel to the missile axis. Calculations, measurements of radiation patterns, and techniques for impedance matching are given to assure best reception from, or transmission to, a circularly-polarized earth-mounted antenna.

6978 Wide-Range Analyzer Traces Precise Curves. Edward F. Feldman. *Electronics*, v. 30, Mar. 1, 1957, p. 184-187.

Sweep generator in conjunction with heterodyne spectrum analyzer measures attenuation characteristics of frequency-selective networks.

6979 Boosting Transistor Switching Speed. Richard H. Baker. *Electronics*, v. 30, Mar. 1, 1957, p. 190-193.

Transistor properties affecting response time in switching circuits; basic circuits for obtaining maximum energy conversion efficiency.

6980 Electrodeposited Rhodium in Co-Axial Radio-Frequency Circuits. D. O. Walter. *Electroplating and Metal Finishing*, v. 10, Feb. 1957, p. 44-46.

Recommendations for thickness of deposits are given, together with some suggestions on design of contact elements.

6981* (Czech.) Principles and Applications of Hall Generators. **Princip a použití Hallových generátorů.** J. Kubátová. *Elektrotechnik*, v. 12, Jan. 1957, p. 7-12.

A discussion of the Hall effect and how it can be used in making probes and pick-ups for various types of measurements which would be difficult by other means.

6982* Studies in the Operating Characteristics of Pre-Heat Hot Cathode Fluorescent Tube Circuits. I. C. G. Ramaswamy. *Indian Institute of Science, Journal*, v. 38, sec. B, Oct. 1956, p. 203-223.

Performance characteristics were studied with different types of ballasts.

6983 The Measurement and Specification of Nonlinear Amplitude Response Characteristics in Television. Stephen Doba, Jr. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 161-165.

6984 Transient Analysis of Coaxial Cables Considering Skin Effect. R. L. Wigington and N. S. Nahman. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 166-174.

Generalized curves are presented by which the response of any length of coaxial cable can be predicted if one point on the attenuation vs. frequency curve is known.

6985 The Serrodyne Frequency Translator. Raymond C. Cumming. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 175-186.

Operation and performance of device which will translate, or shift, the frequency of a signal in a nearly ideal manner. Linear saw-tooth modulation of a transit-time device, such as traveling-wave tube or klystron, is employed.

6986 Direct-Coupled-Resonator Filters. Seymour B. Cohn. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 187-196.

Design formulas and their derivation.

6987 Distributed-Parameter Variable Delay Lines Using Skewed Turns for Delay Equalization. F. D. Lewis and R. M. Frazier. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 196-204.

Method extends to distributed-parameter delay lines the control over the mutual inductances between individual turns which was formerly available only between the coils of a lumped-element artificial line.

6988 Radar Terrain Return at Near-Vertical Incidence. R. K. Moore and C. S. Williams, Jr. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 228-238.

The mean return to a pulse radar can be expressed by a power superposition integral involving the transmitted pulse envelope and a function including effects of ground properties, antenna gain, and distance.

6989 Operation of a Cold Cathode Gas Triode in a High Impedance Self-Biasing Circuit. Marvin Silver. *I. R. E., Proceedings*, v. 45, Feb. 1957, p. 239-242.

When a cold cathode gas triode operates in a high impedance grid circuit in the absence of light or any other external radiation, these tubes have a tendency to fire without any triggering signal applied. This unsatisfactory operation is shown to be a function of the rate of rise of voltage and the time delays found in the breakdown of gaseous discharges.

6990 Signal Theory. William H. Huggins. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 210-216. (TK1 In6.6c Vis.)

6991 Signal Theory in Speech Transmission. Edward E. David, Jr. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 232-244. (TK1 In6.6c Vis.)

Speech is described as a small number of parameters which change at a relatively slow rate.

6992 The Theory of Analytic Band-Limited Signals Applied to Carrier Systems. J. R. V. Oswald. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 244-251. (TK1 In6.6c Vis.)

6993 On Nonuniform Sampling of Bandwidth-Limited Signals. J. L. Yen. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 251-257. (TK1 In6.6c Vis.)

Examines four special processes in detail.

6994 A Study of Rough Amplitude Quantization by Means of Nyquist Sampling Theory. Bernard Widrow. *Institute of Radio Engineers, Transactions on Circuit Theory*, v. CT-3, Dec. 1956, p. 266-276. (TK1 In6.6c Vis.)

Quantization is like "sampling-in-amplitude", which should be distinguished from the usual "sampling-in-time".

6995 Synchro and Resolver Performance Definitions. Lewis A. Knox. *Institute of Radio Engineers, Transactions on Component Parts*, v. CP-3, Dec. 1956, p. 88-98. (TK1 In6.6cp Contin.)

Definitions are presented with some application notes.

6996 Factors Affecting Attenuation of Solid Dielectric Coaxial Cables Above 3000 Megacycles. James R. Hannon. *Institute of Radio Engineers, Transactions on Component Parts*, v. CP-3, Dec. 1956, p. 99-105. (TK1 In6.6cp Contin.)

The major emphasis to obtain low-loss cables rests with the outer conductor construction.

6997 Some Basic Physical Properties of Silicon and How They Relate to Rectifier Design and Application. G. Finn and R. Parsons. *Institute of Radio Engineers, Transactions on Component Parts*, v. CP-3, Dec. 1956, p. 110-113. (TK1 In6.6cp Contin.)

The saturation range and the avalanche range of the reverse characteristic of a Si rectifier and how these regions vary.

6998 Electronic Circuitry. Milton H. Aronson and Charles F. Kezer. *Instruments and Automation*, v. 30, Feb. 1957, p. 260-261.

Circuitry of blocking oscillators, multivibrator, and audio oscillator.

6999 Studies on the Mechanism of Operation of the *L* Cathode. I-II. E. S. Rittner, R. H. Ahlert, and W. C. Rutledge. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 156-173.

Performance characteristics; chemistry of carbonate decomposition and Ba generation; origin of BaO in the evaporant; Ba transport mechanism through the porous plug; factors determining cathode life.

7000 Maser Oscillators. J. C. Helmer. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 212-215.

The frequency-pulling effects of the beam and the oscillation amplitude as a function of cavity-tuning are compared with theoretically expected behavior.

7001 Ferrite Slabs in Transverse Electric Mode Wave Guide. H. Seidel. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 218-226.

Operators are developed which are associated with various transverse strata of the wave-guide cross section corresponding to slabs of different media within the guide. The use of these operators is systematized in application to propagation problems in both rectangular and coaxial type transmission lines.

7002 Rectification Properties of Metal-Silicon Contacts. E. C. Wurst, Jr. and E. H. Borneman. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 235-240.

A qualitative correlation is shown to exist between the work function of the metals and the rectification of these metal contacts on *n* and *p* Si.

7003 Effect of Annealing in Various Gases on the Bulk Lifetime of Germanium. Kurt Weiser. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 271-272.

For an O atmosphere with a trace of H_2O vapor present, the bulk lifetime more than doubled, then decreased to below the initial value. For dry O, or for He, H, or A in the presence of H_2O vapor, the lifetime first remained constant, and then decreased.

7004* The Absorption of Short Radio Waves in the Ionosphere. J. D. Whitehead. *Journal of Atmospheric and Terrestrial Physics*, v. 10, Jan. 1957, p. 12-19.

Experimental measurements are analyzed and equations derived.

7005* The Nondeviative Absorption of High-Frequency Radio Waves in Auroral Latitudes. Sydney Chapman and C. Gordon Little. *Journal of Atmospheric and Terrestrial Physics*, v. 10, Jan. 1957, p. 20-31.

7006* Thermionic Diodes as Energy Converters. Hilary Moss. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 305-322.

An analysis of conversion phenomena in a planar system, relating power output to the various diode parameters.

7007* Density of States for Warped Spherical Energy Surfaces: Zeroth Order Solution for Holes in Silicon and Germanium. Louis Gold. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 323-329.

The formalism for exact summing of states is applied to the problem and found essentially intractable, even when linearization is attempted. A zeroth order calculation is possible which always establishes the lower bound of the density of states mass and in the limit of small warping approaches reasonable accuracy.

7008* Energy Bands in Gallium Arsenide. Joseph Callaway. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 330-340.

There is a general tendency for the valence band to move to lower energies in comparison to Ge while the levels at the bottom of the conduction band are relatively stationary.

7009* Studies of Rectification in a Gas (Nitrogen) Discharge Between Coaxial Cylindrical Electrodes. III. Rectification in Full Ozonizers. V. L. Talekar. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 341-357.

Potential variation of rectification is studied in full ozonizers over a wide range of pressures ranging from 6 to 350 mm. of Hg using a supply frequency of 50 c.p.s.

7010* An Anomalous Periodic Flicker Effect. O. M. White and K. G. Emeleus. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 358-367.

An investigation of the anode currents of diodes with directly heated cathodes and cylindrical anodes showed that irregularities occur in the current voltage characteristic curves when high cathode heating currents are used.

7011* Helix Type Gaseous Discharge Noise Sources at Low Plasma Densities. H. Schnitger. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 368-377.

Use of a helical line for establishing the H. F. electric field increases considerably the possibilities for application of the gaseous discharge noise sources and makes it possible to evaluate in advance the optimum design of such devices.

7012* The Isothermal Reverse Voltage-Current Characteristics of Small Area Alloy Contacts on Germanium. E. G. S. Paige. *Journal of Electronics*, v. 2, ser. 1, Jan. 1957, p. 378-386.

7013 Magnetohydrodynamics. T. G. Cowling. 115 p. 1957. Interscience Publishers, New York. (QA911 C83m)

General ideas and simple applications; magnetohydrostatics; wave motion; magnetic fields and instability; dynamo theories; ionized gases; geophysical and astronomical applications.

7014* (English.) Calculations on a Method for Signal Testing. J. W. Cohen and M. M. Jung. *Philips Telecommunication Review*, v. 17, Jan. 1957, p. 81-89.

Calculations aimed at determining the most suitable form of standard test signal for use in protecting 5-unit teleprinter signals transmitted over radio circuits.

7015* (English.) Measurement of Group Delay in the 95 to 115 Mc/s Band. A. C. H. Borsboom. *Philips Telecommunication Review*, v. 17, Jan. 1957, p. 90-99.

Instrument has an accuracy of 10^{-9} sec. Delay characteristics are displayed on an oscilloscope.

7016* (English.) Transistor Operating Point Stabilization. A. Cramwinckel. *Philips Telecommunication Review*, v. 17, Jan. 1957, p. 100-107.

Stabilization is ineffective at temperatures in excess of approximately 80 C.

7017 (English.) The Anomalous Skin Effect and the Optical Absorptivity of Semiconductors. II. R. B. Dingle. *Physica*, v. 22, Dec. 1956, p. 1237-1241.

General formulas are derived.

7018 Moving Striations in Direct Current Glow Discharges. Harry S. Robertson. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 368-377.

The instability of a spatially uniform plasma suggests that the ion concentrations may vary along the direction of current flow. The ion balance equations are re-examined for wave-like solutions.

7019 Formation of Ion Pairs and Triplets Between Lithium and Zinc in Germanium. F. J. Morin and Howard Reiss. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 384-389.

7020 Nonradiative Transitions of Trapped Electrons in Polar Crystals. J. J. O'Dwyer and P. G. Harper. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 399-400.

Derivation of an algebraic formula which is a good representation over a very wide range of trap depths and coupling constants.

7021 Microplasmas in Silicon. D. J. Rose. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 413-418.

The mechanism is illustrated for the case of the *n-i-p* structure. Approximate calculations show that the ionizing regions of these microplasmas are about 500 A in extent, have a current density=$2X10^6$ amp. per. cc. and a net space charge density=10^{18} per cc.

7022 Electron Self-Energy and Temperature-Dependent Effective Masses in Semiconductors: *n*-Type Ge and Si. H. D. Vasileff. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 441-446.

7023 Effective Masses of Electrons in Indium Arsenide and Indium Antimonide. R. J. Sladek. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 460-464.

Effective electron mass in InAs is 0.020 ± 0.005 in InSb, 0.016 ± 0.007.

7024 Photoconductivity in Lead Selenide. Experimental. James N. Humphrey and Wayne W. Scanlon. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 469-476.

The electrical and photoconductive properties of evaporated films of PbSe were investigated using O, S, Se, and the halogens as sensitizers.

7025 Effects of Thick Oxides on Germanium Surface Properties. M. Lasser, C. Wysocki, and B. Bernstein. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 491-494.

Oxides grown on Ge by heating in O are shown to inhibit interaction between the Ge and the ambient atmosphere. Decay time of the d.c. field effect increases with increasing thickness of the oxide formed.

7026 Classical Boltzmann Theory of Cyclotron Resonance for Warped Surfaces. H. J. Zeiger, Benjamin Lax, and R. N. Dexter. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 495-501.

Calculation of line shapes and harmonic intensities for heavy holes in Si and Ge.

7027 Noise, Time-Constant, and Hall Studies on Lead Sulfide Photoconductive Films. Frances L. Lummis and Richard L. Petritz. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 502-508.

7028 Effective Mass Theory in Solids From a Many-Particle Standpoint. W. Kohn. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 509-516.

For the case of an extra electron or a hole in an insulator or semiconductor, moving under the action of a weak Coulomb field, an effective-mass equation can be derived from some very general properties of the entire many-particle system.

7029 Hall and Drift Mobility in High-Resistivity Single-Crystal Silicon. Donald C. Cronemeyer. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 522-523.

7030 The Theory of Ferromagnetic Resonance at High Signal Powers. H. Suhl. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 209-227.

A more complete theory is developed, with special emphasis on the new state of the medium beyond the threshold of the signal level.

7031 Analysis of Photoconductivity Applied to Cadmium-Sulfide-Type Photoconductors. Richard H. Bube. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 234-248.

7032 Band Structure of Indium Antimonide. Evan O. Kane. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 249-261.

7033 Scattering of Carriers by Ionized Impurities in Semiconductors. F. J. Blatt. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 262-269.

Results were compared with those obtained by application of the B approximation.

7034 Sign Reversal of the Hall Effect in Rhodium. B. R. Coles and J. C. Taylor. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 270-274.

Measurements were made between 4.2 and 300 K in fields up to 22 kilogauss.

7035 Transistorized Scintillation Counter. Louis A. Kueker. *Radio-Electronics*, v. 28, Mar. 1957, p. 34-37.

Construction details of device featuring portability, low current drain, and long battery life.

7036 Flat TV Tube. Eric Leslie. *Radio-Electronics*, v. 28, Mar. 1957, p. 43-45.

The "picture-on-the-wall" tube offers greater simplification for color; greater compactness for black-and-white.

7037 Phase-Swing Vibrato, Easy to Build and Apply. Richard H. Dorf. *Radio-Electronics*, v. 28, Mar. 1957, p. 57-59.

Construction details.

7038 Portable TV Pattern Generator. II. Earl T. Hansen. *Radio-Electronics*, v. 28, Mar. 1957, p. 62-64.

Adjustment details and operating notes.

7039* A Transistor Current-Gain Test Set. Carl David Todd. *Radio & Television News*, v. 57, Mar. 1957, p. 54-56.

Circuit description; construction hints; operation and use.

7040* Reference Data for Radio Engineers. 4th Ed. 1121 p. 1956. International Telephone and Telegraph Corp., New York. (TK6552 F31r4)

Comprehensive basic data frequently needed in radio and electronic engineering.

7041 Linear Gate of 200 Millimicrosecond Duration. E. L. Garwin and A. S. Penfold. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 116-119.

Electronic gate circuit has better than 1% linearity for pulses in the range 1 to 70 volts. The circuit gives an inverted output with a gain very close to unity and accepts positive inputs.

7042* (Spanish.) Applications of Solid Physics to Semiconductors and Transistors. **Aplicaciones de la fisica de sólidos semiconductores y transistores. III.** Transistors. **Transistores.** Ramón de Lucas Ortueta. *Revista de Ciencia Aplicada*, v. 10, Nov.-Dec. 1956, p. 493-501.

Analysis of transistor properties, including reactions, capacities, coefficients of diffusion, average life of holes, limit zones, and properties in d.c.

7043 The Characterization and Crystal-Structure of Caesium Antimonide, a Photo-Electric Surface Material. K. H. Jack and M. M. Wachtel. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 46-60.

7044* Low-Frequency Noise Associated With Remote Television Pickups. H. O. Saunders, Jr. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Feb. 1957, p. 71-73.

Some remedial measures.

7045 The Effects of Overload and Operation at High Altitudes on Electron Tube Life. H. C. Pleak and A. V. Baldwin. *Sylvania Technologist*, v. 10, Jan. 1957, p. 2-4.

Effect of altitude on bulb temperature; relation between altitude and mean life; relation between input power overload and mean life.

7046 A Precision Two-Point Probe for Measuring Resistivity of Semiconductors and Metal-to-Semiconductor Contact Resistance. Jesse Oroshnik. *Sylvania Technologist*, v. 10, Jan. 1957, p. 17-20.

7047 (German.) Transmission Technique in Long Distance Broadcasting. **Übertragungstechnik im fernmeldeweitverkehr.** Otto Henkler. Pt. I-III. 1054 p. 1956. VEB Verlag Technik, Berlin. (TK5101 H38u)

A collective work of theory and practice, based on experience of the German Post Office Dept. Deals chiefly with L.F. devices, and is written for engineers and technical personnel as a hand book in construction, development, manufacturing, and testing of such equipment.

7048 Study of Noise in Semiconductors and Semiconductor Devices. A. van der Ziel. *University of Minnesota Fourth Quarterly Report,* July-Oct. 1956, 77 p. (TK3376 M66s Contin.)

Equipment for measuring noise from semiconducting and photoconducting crystals with crystal resistances varying from 100 ohms up to several megohms. Measurements of shot effect in junction diodes and transistors.

7049* (French.) Grid Control Transmitting Tubes. **Tubes d'émission à grille de contrôle.** F. Hülster. *Vide,* v. 12, Sept.-Oct. 1956, p. 226-235.

A study of the physical problems and technical application of grid tubes, i.e. with a number of electrons controlled, from the point of view of any use of higher frequency.

7050* (French.) Moding in Magnetrons. **Le moding dans les magnétrons.** C. Azéma. *Vide,* v. 12, Sept.-Oct. 1956, p. 236-242.

After studying the starting and oscillation mechanisms of magnetrons, rules were given for the elimination of moding by changing dimensions of the interaction space or the structure of the anode resonators.

7051* (French.) High Power Millimeter Magnetrons. **Magnétrons millimétriques de grande puissance.** R. Zwobada. *Vide,* v. 12, Sept.-Oct. 1956, p. 267-269.

A study of problems concerning the increase of the peak and average power of the mm. magnetrons, and the structure of the 100 kw. magnetron.

7052* (French.) An Emitting Klystron for a Hertzian Beam. **Un klystron emetteur pour faisceau hertzien.** C. Azéma. *Vide,* v. 12, Sept.-Oct. 1956, p. 286-289.

In connection with the emitting klystron for hertzian beams, the resonators, the coupling of the beam to the anode and its electric behavior, and practical application of the tube are studied.

7053 Techniques for Application of Electronic Component Parts in Military Equipment. *Wright Air Development Center, WADC Technical Report* 57-1, v. 1, 1957, 244 p. (TL507 Un3.18w Vis.)

Reliability of military electronic equipment; role of component parts including resistors, capacitors, relays, and switches.

7054* (German.) Semiconductor Properties of Gallium Telluride (Ga_2Te_3). **Zum Halbleiterverhalten von Galliumtellurid (Ga_2Te_3).** Günter Harbeke and Günter Lautz. *Zeitschrift für Naturforschung,* v. 11a, Dec. 1956, p. 1015-1017.

Measurement of electrical conductivity and infra-red absorption at various temperatures.

7055* (German.) Hall Effect and Conductivity Measurement of Thin Potassium Layers. **Hall-Effekts- und Leitfähigkeitsmessungen an dünnen Kaliumschichten.** Werner Cirkler. *Zeitschrift für Physik,* v. 147, no. 4, 1957, p. 481-498.

Measurement of Hall effect and electrical conductivity of potassium layers 30 to 2000 Å thick. Data verifies the theory.

7056* (German.) Research on Stilbene. **Untersuchungen über Stilbene. IX.** Semiconductor Characteristics of Stilbene Derivatives. **Halbleitereigenschaften von Stilbenderivaten.** G. Drefahl and H. J. Henkel. *Zeitschrift für Physikalische Chemie (Leipzig),* v. 206, Nov. 1956, p. 93-101.

An investigation of the semiconductor properties of stilbene, 4-phenyl stilbene, and 4,4'diphenyl stilbene. Photoconductivity is smallest in the direction of the large molecular axes.

7057* (Russian.) Measuring the Rate of Recombination of Carriers by Modulation of the Conductivity. **Izmerenie skorosti rekombinatsii nositelei po moduliatsii provodimosti.** K. D. Glinchuk, E. G. Miseliuk, and E. I. Rashba. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, Dec. 1956, p. 2607-2613.

7058* (Russian.) Electromagnetic Surface Waves Guided by Boundaries With a Small Curvature. **Poverkhnostnye elektromagnitnye volny, napravliaemye granitsei s maloi kriviznoi.** M. A. Miller and V. I. Talanov. *Zhurnal Tekhnicheskoi Fiziki,* v. 26, Dec. 1956, p. 2755-2765.

Shows existence of two types: three-dimensional waves with constant surface characteristics; two-dimensional waves accompanied by an unstable emission field.

See also: **6329** (electronic control of missile drone); **7173** (absorption of radio waves by the ionsphere); **7420** (Hall effect in Au-Cr alloys).

ENGINEERING ECONOMICS

7059* Capital Budgeting Applied to Farm Management. Alan Harrison. *Agricultural Review,* v. 11, Feb. 1957, p. 19-24.

7060 Essentials of Machinery Procurement and Development. Elizabeth Marting and Arnold Dolin. *American Management Association, Special Report No.* 14, 1956, 71 p. (HD28 Am35s Vis.)

Basic aspects of machinery acquisition, including considerations of a financial and tax nature; the contractual safeguards necessary in procurement; problems encountered in a diversified plant; effective use of a limited budget for new equipment; and an over-all view of a procurement program in a large company.

7061 The Importance of Basic Economic Forces. Edmund W. Tabell. *Analysts Journal,* v. 13, Feb. 1957, p. 19-28.

An analysis of trends in population and purchasing power, and their effects on the investment market.

7062* Trends in European Sulphur Consumption. *British Sulphur Corporation, Quarterly Bulletin No.* 15, Dec. 1956, p. 3-11.

7063 A New Approach to Foreign Aid. Chester Bowles. *Bulletin of the Atomic Scientists,* v. 13, Feb. 1957, p. 42-47.

Effective foreign aid must be a long-range project. Its results cannot be immediate. Loan recipients should be encouraged to enter into management contracts with stable business firms.

7064* A New Bank Reserves Plan. Evans Woollen, Jr. *Burroughs Clearing House,* v. 41, Feb. 1957, p. 37 + 9 pages.

A thorough overhauling of the entire system of bank reserve requirements is recommended.

7065 Europe's Chemical Industry Shows Renewed Vigor. Ralph Landau. *Chemical and Engineering News,* v. 35, Feb. 25, 1957, p. 16-21.

A resumé of the European chemical industry's remarkable postwar recovery, with special reference to new products, processes, and plants.

7066 Plant Mortality. J. F. Brennan. *Electrical Engineering,* v. 76, Feb. 1957, p. 131-133.

Simplified approach to problem of determining life expectancy of equipment, utilizing technique of analyzing a parabolic frequency distribution of failures.

7067 Major Metals. M. A. Kriz. *Engineering and Mining Journal,* v. 158, Feb. 1957, p. 75 + 26 pages.

Production, consumption, and other pertinent statistics on Au, Cu, Ag, Pb, Zn, Fe, Mg, U, Ti, Al, and Sn.

7068 Minor Metals. Abbott Renick. *Engineering and Mining Journal,* v. 158, Feb. 1957, p. 99-107, 127.

Production and consumption of Sb, Hg, Th, Be, Li, B, Zr, Cd, Cb, Ta, Bi, semiconductors, and rare earths.

7069 Ferroalloys. Wilmer McInnis, Robert W. Holliday, Hubert W. Davis, and Gilbert L. DeHuff, Jr. *Engineering and Mining Journal,* v. 158, Feb. 1957, p. 108-114.

Some 1956 statistics on Ni, Mo, Mn, Cr, W, and Co.

7070 Non-Metallics. Walter A. Rukeyser, Reginald Rowand, William S. Steele, Brooke L. Gunsallus, Leonard P. Larson, Robert D. McDougal, Nelson C. White, H. F. Dengler, Langbourne M. Williams, and Milford L. Skow. *Engineering and Mining Journal,* v. 158, Feb. 1957, p. 115-127.

Economic statistics on asbestos, fluorspar, barite, potash, vermiculite, perlite, phosphate, feldspar, sulfur, gypsum, and mica.

7071* **The Way Ahead.** *Forbes*, v. 79, Feb. 15, 1957, p. 38, 41.

In the steel industry's biggest year, sales broke all records, but the summer's strike, rising expenses and the excess costs of full-blast operations all took their toll of profits. A good year is predicted for 1957.

7072* **United Kingdom Fuel and Power.** L. F. Haber. *Institute of Fuel, Journal*, v. 30, Feb. 1957, p. 65-83.

Examines the country's past and present supplies of coal, gas, electricity, and fuel oil, and its future requirements, particularly the added contribution which oil and atomic energy will be called upon to make.

7073* **Power and National Prosperity.** A. Parker. *Institute of Fuel, Journal*, v. 30, Feb. 1957, p. 84-91.

Annual income, national income, and standard of living in relation to fuel and energy consumption in the United Kingdom.

7074 **Investment in Cuba. Basic Information for United States Businessmen.** 200 p. 1956. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (HC157 Un3.3i)

Statistics on the Cuban economy; business, tax, and labor laws; basic market data; geography, climate, and population.

7075 **Iron Ore Resources of New Zealand.** J. Luke. 28 p. 1955. Department of Scientific and Industrial Research, Wellington, New Zealand. (TN408.N55 L96i)

Imports; present use of ores; past attempts to establish an iron and steel industry; details of New Zealand deposits.

7076 **Predicting Product Development Costs.** Peter V. Martino. *Machine Design*, v. 29, Feb. 21, 1957, p. 90-100.

Application of statistical techniques in the formulation of an estimating system for accurately forecasting the costs of product development projects. A specific case history.

7077 **Manganese. Report of Subcommittee on Minerals, Materials, and Fuels to the Committee on Interior and Insular Affairs, United States Senate, Eighty-Fourth Congress.** 15 p. 1955. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (HD 9539.M33 Un3.274m)

A report on domestic and foreign Mn sources and on research concerning ore processing.

7078 **Radiation Processing Economics.** F. W. Bradley, W. M. Murray, Jr., and D. R. Whitehouse. *Massachusetts Institute of Technology, Engineering Practice School (U. S. Atomic Energy Commission)*, AECU-3292, May 1955, 25 p. (UF767 U3au Contin.)

Technical and economical analysis of a new unit operation for the processing of commercial products. Effects of irradiation, cost, availability, and use of a variety of β- and γ-ray sources.

7079* (Italian.) The Past, Present and Future of the Italian Ferrous Metallurgy. **Il passato, il presente e l'avvenire della siderurgia italiana.** A. Scortecci. *Metallurgia Italiana*, v. 48, Dec. 1956, p. 545-560.

Historical, technical, and economical study of ferrous production in Italy in comparison with other countries.

7080* **Copper in 1956.** Endicott R. Lovell. *Mining Congress Journal*, v. 43, Feb. 1957, p. 55-58.

Chaotic market conditions characterized the Cu industry in 1956, overshadowing such significant achievements as an increase of 10% in the Free World's primary production, mine expansions, and relative labor peace.

7081* **Lead and Zinc.** Charles R. Ince. *Mining Congress Journal*, v. 43, Feb. 1957, p. 67-68.

Outlook appears to be for a continuance of the firm, stable markets which prevailed in both metals during 1956.

7082* **The Special Metals and Rare Earths.** Eugene B. Hotchkiss. *Mining Congress Journal*, v. 43, Feb. 1957, p. 76-78.

There are in the U. S. immense undeveloped resources of rare metals whose diverse and unusual properties represent the promise of the future in the metals industry.

7083* **Uranium.** Jack Kratchman. *Mining Congress Journal*, v. 43, Feb. 1957, p. 100-104.

The uranium industry surged ahead at an unprecedented rate during 1956. Price guarantees extending until 1966 are the basis for long-range development and planning but the ultimate future will depend upon uranium's role as a fuel for nuclear power.

7084* **Titanium 1956-57.** C. I. Bradford. *Mining Congress Journal*, v. 43, Feb. 1957, p. 113-114.

Demand for Ti in 1956 jumped more than 300%. Although the aircraft industry was largely responsible for this expansion, other industries are finding a rapidly increasing number of uses for this metal.

7085 **1956 Survey of Industrials. The Financial Post, 30th Annual Ed.** 352 p. Maclean-Hunter, Ltd., Toronto. (T12 C2s Over.)

An analysis of the annual reports of 344 Canadian companies. Covers industrials, public utilities, trust and loan companies, merchandising, banks, investment companies, railways, and steamships.

7086 **Aeronautical Development in Australia and Its Potential Contributions to the British Commonwealth.** L. P. Coombes. *Royal Aeronautical Society, Journal*, v. 61, Feb. 1957, p. 69-101.

7087* **A Special Interest Bibliography on Discount Selling, Retail Price-Cutting, and Resale Price Controls.** Stanley C. Hollander, compiler. 52 p. 1956. American Marketing Assn., Chicago. (ZHF5415 Am35s)

7088 **Survey of Mines, 1957. The Financial Post, 31st Annual Ed.** 440 p. Maclean-Hunter, Ltd., Toronto. (T12 C2mn Over.)

Review of Canadian mining activities; company analyses; price range; production tables; maps.

See also: **7143** (coal developments in 1956); **7765** (Pacific Coast plywood industry); **7857** (world energy resources).

FLUID MECHANICS

7089 **Some New Measurements on Sonically Induced Cavitation.** Erwin Meyer. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 4-8.

High intensity sound of 14.6 kc. frequency is focused on a hydrophone, and oscillograms were made of the natural oscillations.

7090 **Quick Graphical Methods in Compressible Flow Problems.** B. Rabineau. *Aircraft Production*, v. 29, Feb. 1957, p. 39-43.

A chart for the solution of a number of common high-speed flow problems.

7091 **Squirting Manometer.** John R. Green and Roy Thomas. *American Journal of Physics*, v. 25, Feb. 1957, p. 98-100.

An analysis of the process of emptying a full, open manometer by increasing the pressure at the closed side until the liquid is contained only in the open side, filling the tube; a slight increase in pressure will then result in an explosive eruption of the liquid.

7092 **Mass-Transfer Cooling in a Laminar Boundary Layer With Constant Fluid Properties.** J. P. Hartnett and E. R. G. Eckert. *ASME, Transactions*, v. 79, Feb. 1957, p. 247-254.

7093 **Convection Phenomena in Fluids Heated From Below.** Simon Ostrach. *ASME, Transactions*, v. 79, Feb. 1957, p. 299-305.

7094 **Use of Nonlinear Valve Characteristics in the Control of a Simple Blending Process.** J. L. Shearer. *ASME, Transactions*, v. 79, Feb. 1957, p. 329-336.

Graphical analyses show the performance of various control schemes when system variables undergo large changes and indicate how valve characteristics may be chosen for the blending process under control.

7095 Measuring Mass Flow With the Boundary-Layer Flowmeter. J. H. Laub. *Control Engineering*, v. 4, Mar. 1957, p. 112-117.

Electrocaloric flowmeter features no pressure drop, no leakage problems; high linearity, and low maintenance.

7096* (English.) **Characteristics of Two-Dimensional Flow Behind a Normal Plate in Contact With a Boundary in a Half Plane.** Mikio Arie. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1956, p. 211-310.

7097* **Stability of Parallel-Branch and Differential Surge Tanks.** O. C. Zienkiewicz. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 7, 1956, p. 265-280.

A mathematical theory of stability of small oscillations in surge tanks of the type where two water surfaces are present.

7098 New Developments in Area Meters. George H. Seemar. *Instruments and Automation*, v. 30, Feb. 1957, p. 256-257.

Refinements in production technique—ultrasonic impact grinding, precision bore tubing, careful surface finish control—make possible reproducible orifices in area meters and reliable repeatability of measurement.

7099 Some Experiments With Two-Dimensional Cavitating Venturis. Kurt Berman and Theodore C. Carnavos. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 148-150.

Geometry is of prime importance for good pressure recovery. Stability of the interface between the cavitation region and downstream liquid zone apparently depends on the divergence angle geometry. Injection of a small flow will modulate a large flow.

7100 Visualization of Low-Density Flows by Means of Oxygen Absorption of Ultraviolet Radiation. Pauline M. Sherman. *Journal of the Aeronautical Sciences*, v. 24, Feb. 1957, p. 93-98, 106.

7101 A New Series for the Calculation of Steady Laminar Boundary Layer Flows. Henry Görtler. *Journal of Mathematics and Mechanics*, v. 6, Jan. 1957, p. 1-66.

Development of a general method for solving problems of plane and steady laminar boundary layer flows in incompressible fluids with arbitrary outer pressure distribution.

7102 Use of Coiled Capillaries in a Convenient Laboratory Flowmeter. H. N. Powell and W. G. Browne. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 138-141.

With coiled capillaries the basic simplicity of the Hagen-Poiseuille flow equation can be retained at flow rates which are not possible with straight capillaries.

7103 On Hydrodynamic Stability in Unlimited Fields of Viscous Flow. N. Curle. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 489-501.

7104 Buoyant Vortex Rings. J. S. Turner. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 61-75 + 2 plates.

Theoretical analysis of vortex rings in a uniform fluid shows that a low density in the core may be expected to keep the material of a ring coherent, to increase the rate of expansion of the radius, and to reduce the rate of progress. In a stably stratified fluid, increasing the buoyancy should lead to a lower final height.

7105 The Theory of Decay Process of Incompressible Isotropic Turbulence. T. Tatsumi. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 16-45.

7106 (Czech.) Mean Velocity of Flow. **Střední rychlosti při proudění.** F. Šubart. *Strojírenství*, v. 7, Jan. 1957, p. 19-24.

Deals with definitions of mean velocity as applied for computing discharge, momentum, and kinetic energy.

7107 (Czech.) Pneumatic Transmission of Measured Quantities. **Pneumatický dálkový přenos měřených veličin.** Z. Voborský. *Strojírenství*, v. 7, Jan. 1957, p. 27-32.

7108* (Russian.) Study of Heat Transfer in a Spiral Canal. **Issledovanie teplootdachi v spiral'nom kanale.** V. G. Fastovskii and A. E. Rovinskii. *Teploenergetika*, v. 4, Jan. 1957, p. 39-41.

The heat transfer is established in the region of the Reynolds number 60 to 2 x 10^4 under pronounced secondary circulation.

See also: **6822** (metering of fluids); **7231** (flow in turbines); **7392** (flow of liquid metal); **7617** (acoustic radiation in a fluid stream); **7624** (magnetohydrodynamics).

FOOD TECHNOLOGY

7109 Comparison of Antioxidants for Fats on an Equivalent Molar Basis. C. W. Everson, C. J. Miller, and F. W. Quackenbush. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 81-83.

An oven incubation method was used to compare 28 phenolic compounds.

7110* **How to Flavor Margarine.** Morris B. Jacobs. *American Perfumer and Aromatics*, v. 69, Feb. 1957, p. 59-60, 63.

Preparation of culture flavors and ripened milk; lactic fermentation.

7111* **Polarographic Determination of Tin in Foods.** J. Markland and F. C. Shenton. *Analyst*, v. 82, Jan. 1957, p. 43-45.

7112* **Incidence and Kinds of Microorganisms Associated With Commercially Dressed Poultry.** Homer W. Walker and John C. Ayres. *Applied Microbiology*, v. 4, Nov. 1956, p. 345-349.

7113* **Effect of Curing Ingredients and Procedures on the Survival and Growth of Staphylococci in and on Cured Meats.** R. V. Lechowich, James B. Evans, and C. F. Niven, Jr. *Applied Microbiology*, v. 4, Nov. 1956, p. 360-363.

7114* (Russian.) Melanoidin Reaction in Canned Foodstuffs. **O meladinovykh reaktsiiakh v konservirovannykh pishchevykh productakh.** A. T. Markh. *Biokhimiia*, v. 21, Nov.-Dec. 1956, p. 636-642.

This is the principal cause of browning and change of flavor and taste of various canned fruits and vegetables.

7115* **Sugar From Cane.** C. D. H. Vernon. *Chemical & Process Engineering*, v. 38, Feb. 1957, p. 55-58.

Juice extraction, prime movers for mills, steam generation, clarification, processing of clarified juice, constructional features of evaporator calandrias, crystallization, centrifuging, and future outlook for the industry.

7116 Just How Reliable Is pH as a Guide to Food Acidity? A. W. Noling and John H. O'Brien. *Food Engineering*, v. 29, Feb. 1957, p. 88-90, 93.

Tests show that ingredients other than acids influence pH readings. Gives tips on how to resolve these differences when testing.

7117 Effects of Ionizing Radiations on Plant Tissues. II. Softening of Different Varieties of Apples and Carrots by Gamma Rays. Frank P. Boyle, Z. I. Kertesz, R. E. Glegg, and M. A. Connor, Jr. *Food Research*, v. 22, Jan.-Feb. 1957, p. 89-95.

7118 Nutrients in Central American Beans. Oudh B. Tandon, Ricardo Bressani, Nevin S. Scrimshaw, and Francis Le Beau. *Journal of Agricultural and Food Chemistry*, v. 5, Feb. 1957, p. 137-142.

Fertility of the land significantly alters the yield and riboflavin content of the kidney bean, but the content of N, methionine, lysine, tryptophan, niacin, and thiamine is not detectably affected by fertility differences.

7119 Deteriorative Reactions Involving Phospholipids and Lipoproteins. C. H. Lea. *Journal of the Science of Food and Agriculture*, v. 8, Jan. 1957, p. 1-13.

Decomposition of lipoprotein, hydrolytic decomposition of phospholipids; autoxidation; lipid "browning" reactions; lipid-protein copolymerization reactions; deterioration in individual commodities.

7120 Deterioration of Dehydrated Meat During Storage. I. Non-Enzymic Deterioration in Absence of Oxygen at Tropical Temperatures. II. Effect of pH and Temperature on Browning Changes in Dehydrated Aqueous Extracts. J. G. Sharp. *Journal of the Science of Food and Agriculture*, v. 8, Jan. 1957, p. 14-25.

7121 The Use of Differential Curves in the Dilatometry of Fats. H. Jasperson and A. A. McKerrigan. *Journal of the Science of Food and Agriculture*, v. 8, Jan. 1957, p. 46-54.

A graphical picture can be obtained of the amount of melting of an individual fat or of a mixture of fats, throughout the range of temperature covering their commercial usefulness.

7122 Effects of Nuclear Explosions on Bulk Food Staples. Sumner C. Rowe. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1163, Dec. 1956, 38 p. (UF767 Un3.1wt Contin.)

Most foods were suitable for emergency feeding at presently suggested AEC tolerances within 15 days after exposure.

7123 The Effect of Nuclear Explosions on Semiperishable Foods and Food Packaging. Robert E. Hardenburg and A. Lloyd Ryall. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1214, Dec. 1956, 59 p. (UF767 Un3.1wt Contin.)

Results with apples, oranges, potatoes, onions, raisins, dry beans, dry milk, flour, cereals, and candy subjected to atomic explosions at distances ranging from ¾ to 15 miles.

7124 The Effect of Nuclear Explosions on Meat and Meat Products. Robert H. Philbeck and Delbert M. Doty. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1216, Dec. 1956, 41 p. (UF767 Un3.1wt Contin.)

7125 Exposure of Foods and Foodstuffs to Nuclear Explosions. (A Summary of Results.) Edwin P. Laug. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1222, Dec. 1956, 19 p. (UF767 Un3.1wt Contin.)

All foods and their containers became more or less radioactive when exposed at a distance of ¼ mile. At distances greater than this, little or no radioactivity was noted.

7126 Effects of Nuclear Explosions on Frozen Foods. H. P. Schmitt. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1215, Jan. 1957, 17 p. (UF767 Un3.1wt Contin.)

Recovered samples were found to be free of physical and thermal damage. Kinesthetic evaluation proved the retention of flavor, color, appearance, and texture. Scientific tests indicated the retention of vitamins, minerals, and proximate composition at all exposures.

7127* (Polish.) Freeze Drying. **Suszenie sublimacyjne. III.** W. Pilniak. *Przemysł Chemiczny*, v. 12, Dec. 1956, p. 663-664.

Discussion of high-vacuum pumps for freeze drying, and the theory and practice of freezers.

See also: **6466** (microorganisms in cream); **6595** (analysis of citrus fruits); **7582** (radiation effects on food).

FUELS AND COMBUSTION

7128 The Application of Heat to Domestic Gas Storage Water Heaters. J. C. Griffiths and C. H. Pountney, Jr. *American Gas Association Laboratories, Research Bulletin* 71, Aug. 1956, 84 p. (TP345 Am35r Vis.)

Analysis of the water heating process produces ideas for improving performance of domestic gas water heaters without seriously increasing size or cost, and minimizing service difficulties.

7129* Bibliography of Fuel Stability. 125 p. Office of the Chief of Ordnance, Washington, D. C. (Z7914.F8 Un3.15b)

Consists of patent and literature abstracts appearing in Chemical Abstracts, 1929-1952, compiled to provide background information for current and future studies of fuel stability and for prediction of this property by accelerated laboratory test methods.

7130* (French.) Scientific Principles Underlying the Various Techniques Used in the Gasification of Solid Fuels. **Principes scientifiques sur lesquels reposent les diverse techniques de la gazéification des combustibles solides. II.** Henry Cassan. *Chaleur & Industrie*, v. 38, Jan. 1957, p. 7-16.

The equilibrium theory can be extended to many problems of gas conversion. The examples studied had practical industrial interests.

7131 State of Slagging Furnace Development in Germany. P. Grasme. *Combustion*, v. 28, Feb. 1957, p. 34-41.

Slagging furnace is currently the preferred firing system for bituminous coals in units of large capacity. The fuel program encompasses a wide range of coals and with the help of additives, can even include coals with high fluid ash temperatures.

7132 Combustion and Heat Transfer in an Open-Hearth Furnace. S. W. Pearson, M. W. Thring, and J. H. Chesters. 82 p. 1956. Iron and Steel Institute, London. (TN601 16s Vis.)

Details of a large-scale trial to check mathematical theory. Reasonable agreement between calculated and observed results indicates essential soundness of the theory in predicting the influence of flame characteristics on heat transfer, and thus on furnace rates.

7133 Fuel Oil Installation for Crucible Furnaces. *Fuel Efficiency*, v. 5, Jan. 1957, p. 27-29.

Some main points to consider for achieving efficient operation.

7134 The Hydrocarbon Content of Fuel Gases. A. L. Roberts, J. H. Towler, and B. H. Holland. *Gas Council, Research Communication* GC31, Nov. 1956, 25 p. (TP700 G21.2r Vis.)

Analyses of carbonization gases; carbonizing plant and operating conditions; effect of carbonizing conditions; analyses of oil gases.

7135 Forced Recirculation in Industrial Gas Appliances. W. E. Francis. *Gas Council, Research Communication* GC34, Nov. 1956, 39 p. (TP700 G22.2r Vis.)

A method of calculating the recirculation induced by a jet burner was developed and proved to be sufficiently accurate for design calculations on industrial gas appliances.

7136 The Prediction of the Combustion Characteristics of Town Gas. M. G. Gilbert and J. A. Prigg. *Gas Council, Research Communication* GC35, Nov. 1956, 47 p. (TP700 G21.2r Vis.)

Predicting combustion characteristics from the gas analysis involves the use of a calculated flame speed and cannot be considered as completely satisfactory; check testing of existing appliances therefore remains necessary.

7137 Experiments on the Hydrogenation of Oils to Gaseous Hydrocarbons. F. J. Dent, R. F. Edge, D. Hebden, F. C. Wood, and T. A. Yarwood. *Gas Council, Research Communication* GC37, Nov. 1956, 51 p. (TP700 G21.2r Vis.)

An investigation of the production of gaseous hydrocarbons by the hydrogenation of petroleum oils at pressures up to 50 atm. and temperatures between 700 and 900 C. Crude petroleum, heavy fuel oil, and distillates were used.

7138* The Production of Water Gas at Beckton. E. Spivey and C. H. Williamson. *Gas Journal*, v. 289, Jan. 1957, p. 238 + 9 pages.

Plant layout and operation; electrical power plant and alternative steam supply system; performance of dust collectors.

7139* A Simple Method for the Assessment of Coal Strength. C. D. Pomeroy. *Institute of Fuel, Journal*, v. 30, Feb. 1957, p. 50-54.

Derives an impact strength index from the degradation of a closely graded coal sample inside a closed cylinder by a succession of hammer drops.

7140* The Grindability of British Coals—A Laboratory Examination. A. Fitton, T. H. Hughes, and T. F. Hurley. *Institute of Fuel, Journal*, v. 30, Feb. 1957, p. 54-65 + 1 plate.

Tests with a Hardgrove machine and a ball mill showed good correlation. Only a broad relationship was found between grindability index and properties. A closer relation between grindability and the contents of volatile matter, C, and H was found when caking power was taken into account.

7141 Methods of Desulphurization of Coke Oven Gas. J. M. Graubard. *Iron and Steel Engineer*, v. 34, Feb. 1957, p. 173-179.

Historical details; modern ovens; location of desulfurization plants; dry and liquid desulfurization processes.

7142 Effect of Turbulence on Radiation Intensity From Propane-Air Flames. Richard R. John and Martin Summerfield. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 169-175, 178.

7143* Coal Research in '56. J. W. Igoe and H. J. Rose. *Mining Congress Journal*, v. 43, Feb. 1957, p. 106-112.

A review of U. S. and Canadian research programs concerned with coal properties, production and preparation, utilization as a fuel, and conversion.

7144* (Czech.) Technical Problems in Treating Coke Oven Gas for Underground Storage. **Technologické problémy úpravy koksárenského plynu pro uskladňování v podzemních zásobnících.** J. Helm. *Paliva*, v. 37, Jan. 1957, p. 27-29.

Behavior of individual gas components in the storage chamber; how to treat the gas for storage underground.

7145* (Czech.) Drying Coal. **Sušení uhlí.** J. Klán. *Paliva*, v. 37, Jan. 1957, p. 30-33.

Use of principal types of coal driers. Equipment and operation of briquette making installations. Drying flotation concentrates.

7146* (Russian.) The Economical Effect of Fuel Drying in Power Plant Operation. **Povishenie ekonomichnosti elektrostantsii putem podsushki topliva.** N. M. Mikhailov. *Teploenergetika*, v. 4, Feb. 1957, p. 20-23.

The application of tubular steam desiccators using selected steam from the turbine for drying very moist fuels.

7147 Production of Crude Ammonia-Synthesis Gas From North Dakota Lignite in an Annular-Retort Gasifier. W. H. Oppelt, T. W. Kamps, C. H. Gronhovd, W. R. Kube, and R. McMurtrie. *U. S. Bureau of Mines, Report of Investigations* 5297, Jan. 1957, 29 p. (TN21 Un3r)

7148 Theoretical Rocket Performance of JP-4 Fuel With Mixtures of Liquid Ozone and Fluorine. Vearl N. Huff and Sanford Gordon. *U. S. National Advisory Committee for Aeronautics, Research Memorandum* E56K14, Jan. 1957, 22 p. (TL782 Un3rm Vis.)

7149 A General System for Calculating Burning Rates of Particles and Drops and Comparison of Calculated Rates for Carbon, Boron, Magnesium, and Isooctane. Kenneth P. Coffin and Richard S. Brokaw. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3929, Feb. 1957, 56 p. (TL570 Un3t)

See also: **6506** (combination in glass tank furnace); **6794** (carbon combustion); **7072** (United Kingdom fuel and power); **7331** (corrosion by flue gases); **7339** (combustion of liquid fuel in open-hearth furnace).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

7150 Advances in Geophysics. H. E. Landsberg, editor. v. III. 378 p. 1956. Academic Press, New York. (QC806 Ad95 Vis.)

Arctic ice island research; polarization of sky light; subcontinental structure; heat flow through the deep sea floor; interior of the earth; subsurface geophysical methods in ground-water hydrology; geophysical research with artificial earth satellites.

7151 A Model Atmosphere for Widespread Precipitation. David Atlas and Edwin Kessler, III. *Aeronautical Engineering Review*, v. 16, Feb. 1957, p. 69-74, 82.

The vertical variations of precipitation rate, water content, radar reflectivity factor, and particle size distributions are examined in the cases of three models giving widespread precipitation.

7152* Application of Moments to Vertical Variability Maps of Stratigraphic Units. W. C. Krumbein and W. G. Libby. *American Association of Petroleum Geologists, Bulletin*, v. 41, Feb. 1957, p. 197-211.

A review of techniques used in vertical variability maps. Application of a method based on computed moments that express vertical variability of selected rock units or characteristics of the stratigraphic section as a continuous function that may be contoured.

7153 X-Ray Measurement of the Iron-Magnesium Ratio in Biotites. John Arthur Gower. *American Journal of Science*, v. 255, Feb. 1957, p. 142-156.

The ratio may be determined by measuring the intensity ratio of (004) to (005). This ratio is highly sensitive to Fe-Mg substitution and is virtually unaffected by other substitutions such as Na for K, F for OH, and Al for Si.

7154* A Common Wind Damage Pattern in Relation to the Classical Tornado. George W. Reynolds. *American Meteorological Society, Bulletin*, v. 38, Jan. 1957, p. 1-5.

A wind damage pattern in which no major damage is accomplished by winds blowing toward the direction from which the storm came can result from a classical tornado if the speed of translation is high enough relative to the maximum wind speed.

7155* Turbulence Measurements in a Young Cyclone Over the Ocean. Andrew F. Bunker. *American Meteorological Society, Bulletin*, v. 38, Jan. 1957, p. 13-16.

Low level observations were obtained which show the thermal structure of the cyclone and magnitudes of turbulence, shearing stresses, and heat flows.

7156* An Approximate Relation Between the Variability of Wind and the Variability of Pressure or Height in the Atmosphere. C. E. Buell. *American Meteorological Society, Bulletin*, v. 38, Feb. 1957, p. 47-51.

7157 Studies on the Chrysotile and Antigorite Components of Serpentine. George L. Kalousek and Lawrence E. Muttart. *American Mineralogist*, v. 42, Jan.-Feb. 1957, p. 1-22.

The fiber and adjoining layer of matrix of several specimens of serpentine were compared for differences in chemical composition, X-ray diffraction, specific volume, loss on heating, differential thermal analysis, thermal balance analysis, and electron microscopy.

7158 The Thermal Expansions of Thoria, Periclase and Diamond. Brian J. Skinner. *American Mineralogist*, v. 42, Jan.-Feb. 1957, p. 39-55.

A central mount, back reflection, X-ray powder camera was designed for measuring thermal expansions.

7159 Storage of Energy in Metamict Minerals. Sheldon F. Kurath. *American Mineralogist*, v. 42, Jan.-Feb. 1957, p. 91-99.

A number of radioactive minerals were studied by differential thermal analysis. Amount of heat evolved in heating under N and the radioactivity of these minerals were quantitatively determined.

7160 Use and Abuse of Earth Waves. L. Don Leet. *American Scientist*, v. 45, Mar. 1957, p. 114-124.

Changes in time-distance relationships are interpreted to give information on structural details of the earth's interior.

7161 The New Zealand Thermal Area and Its Development for Power Production. C. J. Banwell. *ASME, Transactions*, v. 79, Feb. 1957, p. 255-268.

Geological history and relation to the Pacific seismic and volcanic belt. Data on prospecting and development drilling program. Estimated natural heat output of Wairakei area equals 100,000 kw. of generated power.

7162 Flow Sampling and Discharge Measurement in Geothermal Bores. C. J. Banwell. *ASME, Transactions*, v. 79, Feb. 1957, p. 269-278.

Development of a sampler for measuring the heat and mass discharges of steam bores; test results.

7163* The Behaviour of a Chapman Layer in the Night F_2 Region of the Ionosphere, Under the Influence of Gravity, Diffusion, and Attachment. R. A. Duncan. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 436-439.

In the presence of diffusion, gravity, and attachment, a Chapman layer, no matter what its height, maintains its shape decaying uniformly with an effective attachment coefficient equal to the true attachment coefficient at the height of the electron density maximum.

7164* Radio Echo Observations of Meteor Activity in the Southern Hemisphere. C. D. Ellyett and C. S. L. Keay. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 471-480.

7165* Wind Profiles Over the Sea and the Drag at the Sea Surface. E. L. Deacon, P. A. Sheppard, and E. K. Webb. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 511-541 + 1 plate.

It is possible to obtain satisfactory observations of wind profiles on a ship if measurements are made both with the ship nearly stationary and also steaming into wind at moderate speeds. Surface drag coefficients were calculated.

7166* The Use and Application of Drill Collar Stabilizers. Robert E. Ringle. *Drilling*, v. 18, Feb. 1957, p. 75-76, 78-80.

Suggestions for obtaining full benefits from the proven advantages of stabilizing tools.

7167* Use of Electricity to Power Rotary Drilling Rig Drives. R. A. Compton, Jr. and C. D. Neithamer. *Drilling*, v. 18, Feb. 1957, p. 94, 96.

The story of equipment development. System now in use employs a 3-field generator and separately excited shunt motors.

7168* Heat and Temperature in Ore Deposition. C. J. Sullivan. *Economic Geology*, v. 52, Jan.-Feb. 1957, p. 5-24.

Suggests that temperature zoning and paragenesis reflect the thermal stability ranges of minerals in the solid state, not their relative solubilities in aqueous solutions. Reaction and movement of elements in the earth's crust are responses, principally, to heat, temperature, pressure, and chemical gradients. Ore formation is an aspect of these reactions and movements.

7169 Mining Practice. Lloyd E. Antonides. *Engineering and Mining Journal*, v. 158, Feb. 1957, p. 137 + 9 pages.

Some comments on recent developments in both surface and underground mining.

7170* Seismic-Refraction Studies of the Pacific Ocean Basin. I. Crustal Thickness of the Central Equatorial Pacific. Russell W. Raitt. *Geological Society of America, Bulletin*, v. 67, Dec. 1956, p. 1623-1639.

Crustal thickness ranges from 4.8 to 13.0 km. Stations typical of the deep Pacific Basin had an average thickness of 6.31 km. with a standard deviation of 1.01 km.

7171* (English.) **Geophysical Consideration on a Characteristic Factor of a Natural River.** Masakazu Kashiwamura. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1956, p. 103-115.

Increasing rate of discharge is proportional to the breadth and the mean velocity of the river. The proportional constant is given as a certain definite value when the river-bed is stable, and a larger value when the bed is unstable.

7172* Studies of the *E* Layer of the Ionosphere. I. Some Relevant Theoretical Relationships. Edward Appleton and A. J. Lyon. *Journal of Atmospheric and Terrestrial Physics*, v. 10, Jan. 1957, p. 1-11.

7173* Some Measurements of Ionospheric Absorption at Delhi. S. N. Mitra and S. C. Mazumdar. *Journal of Atmospheric and Terrestrial Physics*, v. 10, Jan. 1957, p. 32-43.

Measurements were carried out on 2.5 and 5.0 mc. per sec. waves.

7174 A Field Test of the Gas-Driven Liquid Propane Method of Oil Recovery. Loren H. Jenks, John B. Campbell, and George G. Binder, Jr. *Journal of Petroleum Technology*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 210, Feb. 1957, p. 34-39.

Field test involved repressuring the reservoir to the vapor pressure of liquid propane, injecting the liquid propane, and injecting dry natural gas to drive the propane and oil to the producing wells.

7175 A Laboratory Study of Solvent Flooding. H. N. Hall and T. M. Geffen. *Journal of Petroleum Technology*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 210, Feb. 1957, p. 48-57.

A fluid can be completely displaced from the pores of a rock by a miscible fluid. A mixing zone develops between the two fluids and reaches a stabilized length. Displacement of the solvent by natural gas can be achieved with complete miscibility or with partial miscibility at lower pressures.

7176* Chemistry in Space Flight. II. The Distribution of Planetary Gases. Wayne Proell. *Journal of Space Flight*, v. 8, Dec. 1956, p. 1-5.

Possible composition of atmospheres of various planets. Proposed model of successive "black balls" at various temperatures poised above a hot sun, from which sublimes slowly a mixture of gases, and predicts in the solar system a series of fumarole, water, ice-ammonia, and hydrogen belts.

7177 Meteorology of the Arctic. Sverre Petterssen, W. C. Jacobs, and B. C. Haynes. 207 p. 1956. Office of the Technical Assistant to the Chief of Naval Operations for Polar Projects, Washington, D. C. (QC994.8 P45m)

Detailed climatic conditions.

7178* A Survey of Rotary-Percussive Drilling. II. E. W. Inett. *Mine & Quarry Engineering*, v. 23, Feb. 1957, p. 62-68.

Available rotary-percussive machines and the carriages on which they may be mounted. (To be concluded.)

7179 Minerals of California. Joseph Murdoch and Robert W. Webb. 452 p. 1956. University of California. (TN21 C12b Vis.)

Occurrence and properties of 523 mineral species.

7180* Underground Metal Mining Practice. E. R. Borcherdt. *Mining Congress Journal*, v. 43, Feb. 1957, p. 48-51.

Significant advances have been made recently in drilling and blasting, loading, ground support, transportation, shaft sinking, and hoisting.

7181* Mechanical Coal Mining in '56. F. R. Zachar. *Mining Congress Journal*, v. 43, Feb. 1957, p. 69-72.

Increased mechanization has resulted in a 95% increase in productivity during past 10 yrs. Special interest is being shown in a.c. developments and an a.c. shuttle car was put on the market during the yr.

7182* Inferences From Radio Signals From the Sun and Planets. John Firor. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 2-8.

Radio brightness distribution; occultation of radio stars; active solar radiation.

7183* The Solar Hydromagnetic Dynamo. E. N. Parker. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 8-14.

Beneath the solar photosphere are the two essential conditions for a regenerative hydromagnetic dynamo: cyclonic convection and large-scale shearing in an electrically conducting fluid.

7184* The Terrestrial Dynamo. Walter M. Elsasser. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 14-24.

Application of dynamo theory to studies of the Earth's geomagnetic field.

7185* On Cosmic Magnetic Fields. S. Chandrasekhar. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, Jan. 1957, p. 24-27.

Principal characteristics.

7186 National Coal Board, the First Ten Years. Guy Nott-Bower and R. H. Walkerdine, editors. 138 p. 1956. Colliery Guardian Co., London. (TN808.G7 N84n Over.)

Numerous articles reviewing the first decade of the nationalized coal mining industry in Great Britain.

7187 The Origin of Spinel-Emery Deposits With Particular Reference to Those of the Cortlandt Complex, New York. Gerald M. Friedman. *New York State Museum, Bulletin No.* 351, June 1956, 68 p. (QE145 N42.5b Contin.)

Formation of the spinel-emery is explained by the reaction between the emanations of consolidating granites or granite pegmatites and pyroxene-bearing basic rocks, resulting in the formation of hornblende or biotite and the release of Fe, Mg, and Al ions which gave rise to the emery.

7188 How to Determine Hole Curvature. *Petroleum Engineer (Management Ed.)*, v. 29, Feb. 1957, p. B42-B44, B46-B47.

Dog-leg severity between two successive directional survey stations can be determined quickly by the use of charts that eliminate lengthy calculations.

7189 New Latex-Cement Solves Special Well Problems. J. T. Rollins and R. D. Davidson. *Petroleum Engineer (Management Ed.)*, v. 29, Feb. 1957, p. B48, B50-B51.

Cement forms stronger bond, is more resilient, resists contamination, has low fluid loss, and low shrinkage.

7190 Complete Automation in Water Injection. R. H. Travis. *Petroleum Engineer (Management Ed.)*, v. 29, Feb. 1957, p. B76, B-78.

Electrodes in water leg of reservoir tank are basis of system controlling water production, transfer, and injection into 38 wells.

7191 The Height Variation of Upper Atmospheric Winds. J. S. Greenhow and E. L. Neufeld. *Philosophical Magazine*, v. 1, ser. 8, Dec. 1956, p. 1157-1171.

The radio echo meteor technique was used to investigate the variation of wind velocity with altitude in the 80 to 100 km. region.

7192 Precision of the Geodimeter as Affected by the Speed of Light in Air. D. T. Williams and John R. Williams. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 108-115.

The Geodimeter was analyzed as to limitations on its precision in range measurement imposed by uncertainties in the speed of light. Routine measurements to one part in 10^6 are concluded to be warranted, as far as propagational errors are concerned, up to ranges of about 100 km. Higher precisions, up to 1 in 10^7, are attainable.

7193 The Distribution of Stress and Velocity in Glaciers and Ice-Sheets. J. F. Nye. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 113-133.

7194 A Radio Map of the Sky at 1.2 Meters. H. C. Ko and J. D. Kraus. *Sky and Telescope, Suppl. Bulletin No.* 5, v. 16, Feb. 1957, p. 160-161.

7195 Galaxies and Their Interactions. Otto Struve. *Sky and Telescope, Suppl. Bulletin No.* 5, v. 16, Feb. 1957, p. 162-166.

Observations on the spatial distribution of galaxies.

7196 By-Products of the Search for Natural Satellites of the Earth. Charles F. Capen, Jr. *Sky and Telescope, Suppl. Bulletin No.* 5, v. 16, Feb. 1957, p. 173-175.

Some unusual phenomena were observed visually or recorded on film during the two yr. search.

7197 (English and French.) The Solar Spectrum From 2.8 to 23.7 Microns. **Le spectre solaire de 2,8 a 23,7 Microns. I.** Photometric Atlas. **Atlas photométrique.** M. Migeotte, L. Neven, and J. Swensson. Not paged. 1956. Geophysics Research Directorate of Air Force, Cambridge Research Center, Air Research and Development Command, U. S. Air Force. (QC455 M58S Over.)

Description of observation station in the Swiss Alps and its equipment. Meteorological data. Very-large-scale spectra.

See also: **6346** (characteristics of upper atmosphere); **6831** (determination of geostrophic vorticity); **6889** (selection of route for transatlantic cable); **7004** (absorption of radio waves in ionosphere); **7005** (atmospheric absorption of H. F. radio waves); **7075** (New Zealand iron ore deposits); **7088** (Canadian mining activities); **7206** (photographs of cloud models); **7716** (atmospheric diffusion); **7722** (meteorological aspects of air pollution); **7751** (ventilation of mines).

GRAPHIC ARTS

7198 The Mechanism of Dye Formation in Color Photography. III. Oxidative Condensation With *p*-Phenylenediamines in Aqueous Alkaline Solutions. IV. Oxidative Condensation in Acidic Aqueous Solutions. L. K. J. Tong and M. Carolyn Glesmann. *American Chemical Society, Journal*, v. 79, Feb. 5, 1957, p. 583-594.

7199* Ink Making in Germany. Martin Hartmann. *American Ink Maker*, v. 35, Feb. 1957, p. 34-37, 65, 67.

Rehabilitation of the West German printing ink industry has proceeded swiftly.

7200* Dyes for Ball Point Pen Inks. Normal L. Anderson. *American Ink Maker*, v. 35, Feb. 1957, p. 38-39, 63, 65.

Problems of formulation and current developments.

7201* Ink for Gravure Printing. V. Screens for Gravure Printing. *American Pressman*, v. 67, Feb. 1957, p. 33-39.

Some screen recommendations; gravure type in packaging; colorgravure art mediums; glossary of terms used in reference to rotogravure inks.

7202 The Alco Process. I. Hermann Kott. *Gravure*, v. 3, Feb. 1957, p. 10-12, 42, 44.

Function and characteristics of Rotofilm, used as a replacement for carbon tissue in gravure photomechanics.

7203 Combination Printing. Warren R. Daum and John F. Kirby. *Gravure*, v. 3, Feb. 1957, p. 14-15, 44-46.

Combination flexographic and gravure printing gives special effects by combining best qualities of both methods, and results in cost savings in both cylinders and equipment. (To be concluded.)

7204* Camera Probes Furnace. Charles Burns. *Industrial Photography*, v. 6, Feb. 1957, p. 22-25.

Photographs of furnace interior made with unique periscope aid steel-making research.

7205* Shadowgraphs & Streak Photos in Ballistics Research. Louis Alexander. *Industrial Photography*, v. 6, Feb. 1957, p. 26-27.

Cameras and film record events as 10,000 mile an hr. test missiles fly through air-tight tank.

7206* Photography Helps Do Something About the Weather. Richard M. Schotland and Edward J. Kaplin. *Industrial Photography*, v. 6, Feb. 1957, p. 28-29.

Stroboscopic photographs of cloud droplet models assist scientists' study into physics of rain formation.

7207* Measuring Definition in Lithography. Warren L. Rhodes. *Modern Lithography*, v. 25, Feb. 1957, p. 67-68, 113.

Evaluation of press factors which affect sharpness.

7208* Graphic Arts Research. J. Homer Winkler. *Photoengravers Bulletin*, v. 46, Feb. 1957, p. 13-20.

After reviewing trends in U. S. total research effort and research in the graphic arts industry, concludes that research expenditures are not in keeping with the industry's sales volume. Indicates examples where past research investments have paid off generously and dramatically. Points out need for increased research and areas where effort could profitably be applied.

7209* (English.) **Gloss of Machine Glazed Papers.** Jien Nishiwaki. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 53-57.

The surface of glossy paper and the assumed value of its diffuse component defined experimentally are measured with a goniophotometer.

7210* Photoprogress in 1956. George T. Eaton. *PSA Journal*, v. 23, Feb. 1957, p. 34-38.

Developments in techniques and equipment.

7211* Developmental Possibilities in 16 mm Projectors. John A. Maurer. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Feb. 1957, p. 49-52.

The possibility of developing a portable system capable of obtaining full quality performance from 16 mm. film is discussed. These films are at present, capable of approximating 35 mm. picture and sound quality.

7212* Improved Technique for Ion-Exchange Recovery of Eastman Color Developers. John H. Priesthoff. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Feb. 1957, p. 64-65.

Developer is passed through the ion-exchange column only as long as NaBr is completely removed. The effluent solution is reconstituted to replenisher status by the addition of untreated overflow developer, developing agent, and sodium sulfite.

See also: **7691** (magnetic tape and film).

HEAT POWER

7213 Boiling Density in Vertical Rectangular Multichannel Sections With Natural Circulation. William Howard Cook. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5621, Nov. 1956, 125 p. (UF767 Un3.1an Contin.)

Steam formation in high-resistivity, demineralized water.

7214 Seal Leakage in the Rotary Regenerator and Its Effect on Rotary-Regenerator Design for Gas Turbines. D. B. Harper. *ASME, Transactions*, v. 79, Feb. 1957, p. 233-245.

Analysis of rotary-regenerator seal leakage predicts the leakage quantity and the variations of pressure gradient under the sealing shoe.

7215 Mean-Temperature Difference in One, Two, and Three-Pass Crossflow Heat Exchangers. R. A. Stevens, J. Fernandez, and J. R. Woolf. *ASME, Transactions*, v. 79, Feb. 1957, p. 287-297.

Review of mean-temperature-difference equations for all previously solved cases of cross-flow exchangers. All previously unsolved cases of two and three-pass crossflow exchangers are also solved by numerical integration, using a cyclical reiteration process for the countercurrent cases.

7216 Experimental Superheater for Steam at 2000 Psi and 1250 F—Report After 14,281 Hours of Operation. J. H. Hoke and F. Eberle. *ASME, Transactions*, v. 79, Feb. 1957, p. 307-317.

Results of metallurgical examination of superheater alloys.

7217 Instrumentation for Steam-Consumption Tests on Medium Steam Turbine-Generator Sets. D. E. Kimball. *ASME, Transactions*, v. 79, Feb. 1957, p. 357-364.

7218 Procedures for Testing Large Steam Turbine-Generators in Central Stations. E. M. Kratz and J. C. Westcott. *ASME, Transactions*, v. 79, Feb. 1957, p. 365-371.

7219 First Commercial Supercritical-Pressure Steam-Electric Generating Unit for Philo Plant. S. N. Fiala. *ASME, Transactions*, v. 79, Feb. 1957, p. 389-407.

Engineering, design, and operating data on 120,000-kw. steam-electric generating unit operating at 4500 psi., 1150 F initial temperature with double reheat.

7220 First Commercial Supercritical-Pressure Steam Generator for Philo Plant. W. H. Rowand and A. M. Frendberg. *ASME, Transactions*, v. 79, Feb. 1957, p. 409-416.

Design, fabrication, and instrumentation details.

7221 First Commercial Supercritical-Pressure Steam Turbine Built for the Philo Plant. C. W. Elston and R. Sheppard. *ASME, Transactions*, v. 79, Feb. 1957, p. 417-426.

Essential design features of a 125,000-kw. 3600-r.p.m. tandem-compound, double-flow steam turbine designed for steam conditions of 4500 psi. g. 1150 F initial temperature, 1050 F at the first reheat, and 1000 F at the second reheat.

7222 Promoters for the Dropwise Condensation of Steam. I. Preparation of Compounds Containing Monofunctional Sulphur Groups. II. Preparation of Compounds Containing Polyfunctional Sulphur Groups. III. Preparation of Silicon and Phosphorus Compounds. IV. Discussion of Dropwise Condensation and Testing of Compounds. L. C. F. Blackman and M. J. S. Dewar. *Chemical Society, Journal*, Jan. 1957, p. 162-176 + 1 plate.

7223 The Use of Hydrazine as an Oxygen Scavenger in H. P. Boilers. W. F. Stones. *Chemistry & Industry*, no. 5, Feb. 2, 1957, p. 120-128.

Properties of hydrazine and handling precautions; details of plant and operation. Hydrazine proved more effective than sodium sulfite.

7224* Indirect-Fired Gas Turbines. Donald L. Mordell. *Engineer*, v. 203, Feb. 8, 1957, p. 210-213.

Performance and features of a self-contained coal-fired exhaust-heated gas turbine. Furnace and heater problems. Applications.

7225* High-Output Four-Stroke Engines. *Gas and Oil Power*, v. 52, Jan. 1957, p. 2-3.

Survey covers British diesel engines of 2,000 b. hp. and over and underlines the integral part which pressure-charging plays in achieving high specific output.

7226* Alcohol as Principal Fuel in High Speed Diesel Engines. T. L. Narasimhan, M. R. K. Rao, and H. A. Havemann. *Indian Institute of Science, Journal*, v. 38, sec. B, Oct. 1956, p. 224-247 + 2 plates.

7227 On the Development of Rational Scaling Procedures for Liquid-Fuel Rocket Engines. S. S. Penner. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 156-161, 168.

A critical summary of recent theoretical studies concerning similarity analysis and the scaling-up of liquid-fuel rocket engines. Suggestions for a developmental program.

7228 Similitude Considerations in Turbojet Engines. S. Way. *Jet Propulsion*, v. 27, pt. 1, Feb. 1957, p. 162-168.

Physical similarity principles in flow and combustion systems. Application of these principles to separate engine components and to the engine as a whole.

7229* Control of Automatic Extraction Industrial Steam Turbines. V. T. Dimitroff. *Plant*, v. 15, Feb. 1957, p. 48-51.

Operation of such turbine controls as speed correctors and extractor limitators; also, mixed pressure operation, speed reset, initial pressure control, underspeed release, and use of supervisory instruments.

7230 (Czech.) Superheaters of Austenitic Steel for High-Pressure, High-Temperature Boilers. **Austenitické přehřiváče vysokotlakých vysokoteplotních kotlů.** R. Doležal. *Strojírenství*, v. 7, Jan. 1957, p. 9-14.

7231* (Russian.) Flow Through a Radial Clearance of a Turbine Stage. **Protechki cherez radial'nyi zazor trubinnoi stupeni.** A. M. Zavadovskii. *Teploenergetika*, v. 4, Jan. 1957, p. 8-12.

Effect of the radial clearance between the tops of moving blades without cover bands and the casing upon the efficiency factor of the stage.

7232* (Russian.) Heat Transfer in Condensation of Steam Flowing in a Horizontal Group of Tubes. **Teplootdacha pri kondensatsii dvizhushchegosia para v gorizontal'nom trubnom puchke.** S. N. Fuks. *Teploenergetika*, v. 4, Jan. 1957, p. 35-38.

7233 Free-Jet Tests of A 1.1-Inch-Diameter Supersonic Ram-Jet Engine. Joseph H. Judd and Otto F. Trout, Jr. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3906, Feb. 1957, 24 p. (TL570 Un3t)

Engine performance characteristics are presented for a Mach number range from 1.42 to 2.28.

See also: **6905** (steam power plant); **7317** (corrosion in superheaters); **7322** (caustic cracking in steam boilers); **7546** (atomic steam power plant).

INFORMATION—PREPARATION AND DISSEMINATION

7234 Information Conveyed by Vowels. Peter Ladefoged and D. E. Broadbent. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 98-104.

Most speech sounds convey linguistic, socio-linguistic, and personal information. Experiment shows the linguistic information conveyed by a vowel sound.

7235 Realization of Prosodic Features in Whispered Speech. W. Meyer-Eppler. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 104-106.

Experiments with a visible-speech analyzer.

7236 Some Results of Research on Speech Perception. Alvin M. Liberman. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 117-123.

Describes, and attempts to interpret, some of the research in acoustic cues.

7237 Machine Searching of Metallurgical Literature. Allen Kent, Robert E. Booth, and J. W. Perry. *Metal Progress*, v. 71, Feb. 1957, p. 71-75.

The ASM research project to formulate a coding system adaptable to machine feed is described.

7238* A Periodicals Renewing System. Marion D. Minard. *Special Libraries*, v. 48, Feb. 1957, p. 70-71.

Flow sheet illustrates procedure which eliminates three lengthy, separate typings.

See also: **6855** (information theory).

INSTRUMENTATION

7239* Determination of Moisture in Solids. P. J. Geary. 51 p. 1956. British Scientific Instrument Research Assn., Kent, England. (QC53 G26d)

A short survey of methods and apparatus.

7240 Instrumentation for Use in Storage Battery Studies. G. W. Work and C. P. Wales. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 67-70.

Storage battery analyzer features simplicity and accuracy of control, a wide scope of variables measured, and a complete, continuous record. A null-balance servo system controls the output of the rectified d.c. power supply at any desired current or voltage by continuously regulating the a.c. input.

7241* (Czech.) Oxygen Analysis by Physical Methods. **Analysa O_2 fysikálními methodami.** Antonín Gemperle. *Elektrotechnický Obzor*, v. 46, Jan. 1957, p. 42-48.

Possible applications of magnetic analyzers in industrial operations are surveyed.

7242* (French.) The Measurement of Surface Tensions by Means of Capillary Tensimeters. **De la mesure des tensions superficielles à l'aide des tensiomètres capillaires.** A. R. Pochan. *Génie Chimique (Supplement to Chimie & Industrie)*, v. 77, Jan. 1957, p. 13-18.

A new method, based on interfacial tensions, for measuring the densities of minute volumes of liquids is useful in microchemistry and biology.

7243 Thermal Conductivity Measurements. J. M. Davidson. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-47063, Dec. 1956, 18 p. (UF767 Un3.1hw Contin.)

Three thermal conductivity measuring devices for use with atomic reactor materials. Derivation of working equations.

7244 Reflection of Plane-Polarized, Electromagnetic Radiation From an Echelette Diffraction Grating. William C. Meecham and C. W. Peters. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 216-217.

7245 Laboratory Glassblowing. Dealing With the Fundamental Operations of Glassblowing and Glass Working Techniques for Laboratory Workers. L. M. Parr and C. A. Hendley. 160 p. 1956. George Newnes, Ltd., London. (TP859 P24L)

Techniques for making and repairing glass apparatus.

7246* (German.) New Grain and Texture Measurement Ocular. **Ein neues Korngrössen- und Gefüge-Messokular.** F. Gabler. *Mikroskopie*, v. 11, Dec. 1956, p. 214-219.

A further development of the Mitsche-Reichert eyepiece.

7247* (German.) Electron Microscopic Replica Preparation Using Thin Cellulose Membranes. **Elektronenmikroskopische Präparationsartefakte dünner Cellulosemembranen.** A. Frey-Wyssling, K. Mühlethaler, and H. Moor. *Mikroskopie*, v. 11, Dec. 1956, p. 219-223.

7248 Measurement of the Diameter of Opaque Cylinders by Scanning Microscopy. J. A. Dobrowolski, W. Godfrey, P. N. Slater, and W. Weinstein. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 186-190.

Sources of systematic error are examined.

7249 Solar Furnaces: Problems & Prospects. Lawrence Sandek. *Research & Engineering*, v. 3, Feb. 1957, p. 8-11.

The future of the solar furnace seems to lie more in its continued refinement and application to manufacturing processes and research than as a replacement or supplement for our diminishing fossil fuels.

7250 Germanium Resistance Thermometers Suitable for Low-Temperature Calorimetry. J. E. Kunzler, T. H. Geballe, and G. W. Hull. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 96-98.

Single crystal "bridges" of suitably doped Ge were encased in a strain-free manner within nonmagnetic Pt-glass capsules to provide low-temperature resistance thermometers.

7251 Comparison Type Nephelometer. William Finley Wright. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 129-134.

Turbidities are measured by both absorption and scattering of light.

7252 Plane Parallel Plate Transmission Line Stark Microwave Spectrograph. S. A. Marshall and J. Weber. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 134-137.

Instrument gives intense sharp lines out to Stark field strengths of the order of 25 statvolts per cm.

7253 Vacuum Problems and Techniques. C. E. Normand, Frank A. Knox, G. W. Monk, Alan J. Samuel, and W. R. Perret. *U. S. Atomic Energy Commission*, TID-5210, Jan. 1950, 265 p. (UF767 Un3ti Contin.)

Production-plant vacuum systems; materials used; cold traps and refrigerants; instrumentation; testing and leak detection; pump-down and outgassing procedures.

See also: **6635** (ionization chamber); **6900** (light source); **7035** (scintillation counter); **7347** (level indicating device); **7574** (radiation detectors).

LUBRICATION AND FRICTION

7254 The Maximum Temperature Profile in Journal Bearings. O. Pinkus and B. Sternlicht. *ASME, Transactions*, v. 79, Feb. 1957, p. 337-341.

An expression for the circumferential temperature distribution in the mid-section of a journal bearing is derived which in implicit form presents temperature as a function of angle, with bearing geometry and operating conditions as parameters.

7255 Temperature Distribution in the Journal-Bearing Lubricant Film. M. B. Purvis, W. E. Meyer, and T. C. Benton. *ASME, Transactions*, v. 79, Feb. 1957, p. 343-350.

Equations for the adiabatic temperature distribution are obtained for both the infinite bearing and the short bearing.

7256 The Spring-Supported Thrust Bearing. Fletcher Osterle and Edward Saibel. *ASME, Transactions*, v. 79, Feb. 1957, p. 351-355.

The slider bearing with the bearing a flexible plate mounted on springs is analyzed for its load-carrying characteristics.

7257* Electronic Oil Film Thickness Indicators for Machinery Bearings. M. L. Greenough and Charles E. White. *Bureau of Ships Journal*, v. 5, Mar. 1957, p. 25-29.

Installation of instrumentation on the bearing; application difficulties.

7258 Radiation Resistant Greases. R. O. Bolt, J. G. Carroll, B. W. Hotten, and S. R. Calish. *California Research Corporation (U. S. Atomic Energy Commission)*, AECU-3148, June 1956, 42 p. (UF767 U3au Contin.)

Radiation resistance of a grease depends on the oil, the gelling agent, and the inhibitors, and varies with each component of a formulation. Greases of enhanced radiation stability can be made for alkyl aromatic oils and selected gelling agents.

7259* Hydrodynamic Lubrication of Piston Rings and Commutator Brushes. II. W. Lewicki. *Engineer*, v. 203, Jan. 25, 1957, p. 122-124.

Lubrication mechanism is expressed in algebraic equations.

7260 Abrasives and Wear. *Lubrication*, v. 43, Feb. 1957, p. 13-24.

Bearing design; bearing damage; abrasive materials and their effects; elimination of abrasives from oil systems.

7261* Studies of Formation & Behavior of an Extreme-Pressure Film. V. N. Borsoff and C. D. Wagner. *Lubrication Engineering*, v. 13, Feb. 1957, p. 91-99.

Distribution and thickness of sulfur-containing films on actual gear surfaces was determined by employing a sulfur-35-containing agent and autoradiography as a measurement technique.

7262 (French.) Developing an Experimental Method for Determining the Effect of Lubricants on Piston Seizure in Two Cycle Gasoline Engines. **Mise au point d'une méthode d'essai permettant de déterminer l'influence des lubrifiants sur le grippage des pistons dans les moteurs 2 temps à essence.** A. Dyson. *Revue de l'Institut Francais du Petrole et Annales des Combustibles Liquides*, v. 11, Nov. 1956, p. 1489-1495.

7263 An Examination of a Mild Wear Process. J. F. Archard and W. Hirst. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 515-528 + 3 plates.

A study of the wear of hardened high-speed tool steel rubbing on itself at a speed of 66 cm. per sec. under loads of a few kg.

7264 The Effect of a Tangential Force on the Contact of Metallic Bodies. J. S. Courtney-Pratt and E. Eisner. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 529-550 + 1 plate.

Gold, Pt, Sn, In, and mild steel specimens were examined.

7265 (Czech.) Measuring the Wear of Machine Parts With Radioactive Isotopes. **Měření opotřebení strojních součástí metodou radioaktivních isotopů.** L. Šimon. *Strojírenství*, v. 7, Jan. 1957, p. 41-48.

Measuring procedure; selection of suitable isotopes, their activation, and introduction into the parts.

See also: **6606** (determination of Pb in lubricating oil).

MECHANICAL ENGINEERING

7266 Flexural Waves in Elastic Beams of Circular Cross Section. H. Norman Abramson. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 42-46.

7267 Behavior of Materials Under Combined Stresses in Pressurized Structures. A. D. Topping. *Aeronautical Engineering Review*, v. 16, Feb. 1957, p. 56-59.

Suggests two approaches in the minimum-weight design of pressurized aircraft structures. Attempts to correlate experience with such diverse materials as rock and fabric.

7268 Investigation of Causes of Low Wheel-to-Rail Adhesion and Possible Methods of Improving It. F. G. Fisher and R. K. Allen. *ASME, Transactions*, v. 79, Feb. 1957, p. 377-388.

Running adhesions in excess of 26% can be maintained by the application of certain materials to locomotive drivers or to the rail.

7269 Contributions to Hydraulic Control. VII. Analysis of the Effects of Nonlinearity in a Valve-Controlled Hydraulic Drive. E. I. Reeves. *ASME, Transactions*, v. 79, Feb. 1957, p. 427-432.

7270* Bounds for the Collapse Load of a Beam Compressed by Three Dies. W. Freiberger. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 419-424.

7271* Devices for Damping Mechanical Vibrations, a Bibliography. Mildred Benton, compiler. 94 p. 1956. Naval Research Laboratory, Washington, D. C. (ZTA355 B44d)

Includes references to periodical articles and technical report literature from 1924 to Aug. 1956.

7272 Beams With Full End Fixity. Oxial Forces May Increase Load Capacity Many Times. R. M. Haythornthwaite. *Engineering*, v. 183, Jan. 25, 1957, p. 110-112.

Plastic analysis of beam at a finite deflection indicates that induced longitudinal forces will increase the load-carrying capacity substantially after only moderate deformation.

7273 Simplified Bolted Joints for High Fatigue Strength. Tight Clamping, Close Pitch, and Stress-Relieving Grooves. R. B. Heywood. *Engineering*, v. 183, Feb. 8, 1957, p. 174-178.

The short joint, with closely-pitched bolts clamped tight and with a stress-relieving groove, is shown to be superior in fatigue to the long tapered joint.

7274 Examples in Mechanical Vibrations. John Hannah and R. C. Stephens. 152 p. 1956. Edward Arnold Publishers, Ltd., London. (TA355 H19e)

Includes formulas and problems dealing with free vibrations, transverse vibrations of beams, whirling of shafts, and torsional, damped, forced, and forced-damped vibrations.

7275* (English.) **Some Remarks on the Three-Dimensional Problems Concerned With the Isotropic and Anisotropic Elastic Solids.** Kin-ichi Hata. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1956, p. 129-177.

Mathematical solutions of stress-analysis equations.

7276* Some Aspects of Ship and Propeller Experiments. A. M. Robb. *Institution of Engineers & Shipbuilders in Scotland, Transactions*, v. 100, pt. 2, 1956-1957, p. 51-116.

Derivation of a skin friction line; expansion of model propeller results. A scale effect between model and full-size propeller is suggested.

7277* Hydraulic Accumulators in Heavy Industry. J. G. Frith. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 5, 1956, p. 185-205 + 2 plates.

Principal features of the weight- and gas-loaded types together with the applications where they are of particular service.

7278 The Design of Mill Buildings. J. J. Murray and Thomas C. Graham. *Iron and Steel Engineer*, v. 34, Feb. 1957, p. 159-172.

7279 Tables and Curves for Deformations and Stresses in Circular Cylindrical Shells Under Localized Loadings. Joseph Kempner, James Sheng, and Frederick V. Pohle. *Journal of the Aeronautical Sciences*, v. 24, Feb. 1957, p. 119-129.

7280 The Calculation of Thermoelastic Beam Deflections by the Principle of Virtual Work. Bruno A. Boley. *Journal of the Aeronautical Sciences*, v. 24, Feb. 1957, p. 139-141.

Derivation of formula and evaluation of its accuracy with particular reference to rectangular beams under arbitary temperature distributions.

7281 Significance of Material Properties in Design for Fatigue Loading. III. Joseph Marin. *Machine Design*, v. 29, Feb. 21, 1957, p. 124-134.

A review of strength considerations in the design of members subjected to both simple and combined fatigue stresses.

7282* Fabrication of Vulcanized Fiber. J. Macadam. *Mechanical Engineering*, v. 79, Feb. 1957, p. 154-156.

Methods of sawing, slotting, turning, drilling, tapping, shearing, punching, shaving, forming, and finishing; suggested types of tools, speed, and feed; test values; limiting effects of heat and moisture.

7283 Buckling and Post-Buckling Behaviour of a Cylindrical Panel Under Axial Compression. W. T. Koiter. *Nationaal Luchtvaartlaboratorium, Rapport* NLL-TR S.476, May 1956, 14 p. (TL526.N3 N38.5r Contin.)

An investigation for one set of boundary conditions along the longitudinal edges suggests that the initial post-buckling stage is stable only for very narrow panels. Behavior of a narrow curved panel in the advanced post-buckling stage will approach that of a flat panel of the same width.

7284* Aluminium Honeycomb Sandwich Construction. Bryan R. Noton. *Shell Aviation News*, no. 223, Jan. 1957, p. 17-21.

Properties; bonding sandwich components; design advantages and disadvantages; applications in aircraft design; inspection of cover plate bonding; repairability.

7285 The Ultimate-Load Theory Applied to the Design of Reinforced & Prestressed Concrete Frames. A. L. L. Baker. 91 p. 1956. Concrete Publications, Ltd., London. (TG260 B17u)

Ultimate strength in bending of beams; plastic deformations of hinges and members; theory of plastic hinges and ultimate strength of frames; general expression for rotations of plastic hinges.

7286 Thin-Walled Plywood Cylinders in Bending and Torsion. Edward W. Kuenzi. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1501, Jan. 1953, 7 p. (TS800 Un3.3r Contin.)

Results of tests on empirical relations between bending and torsional buckling stresses under combined loads.

7287 Strength of Orthotropic Materials Subjected to Combined Stresses. Charles B. Norris. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1816, Mar. 1955, 34 p. (TS800 Un3.3r Contin.)

Theory is based on the Henky-von Misses theory of energy due to change of shape.

7288 Tensile Properties of Glass-Fabric Laminates With Laminations Oriented in Any Way. E. C. O. Erickson and C. B. Norris. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1853, Nov. 1955, 67 p. (TS800 Un3.3r Contin.)

Comparisons between computed and experimental verification values in tension are presented for two laminates composed of the same fabric and for one laminate combining three different fabrics.

7289 Buckling of Long, Thin, Plywood Cylinders in Axial Compression. Mathematical Treatment. H. W. March. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1322-A, Mar. 1956, 46 p. (TS800 Un3.3r Contin.)

Presents a theoretical curve for determining the buckling stress of a long thin plywood cylinder.

7290 Effect of Elliptic or Circular Holes on the Stress Distribution in Plates of Wood or Plywood Considered as Orthotropic Materials. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1510, Mar. 1956, 51 p. (TS800 Un3.3r Contin.)

A mathematical analysis.

7291 The Static Strength of Rivets Subjected to Combined Tension and Shear. William H. Munse and Hugh L. Cox. *University of Illinois, Engineering Experiment Station Bulletin No.* 437, Dec. 1956, 28 p. (T1 166 Vis.)

The ultimate strength can be conveniently expressed in the form of a non-dimensional elliptical interaction curve or in the form of other simple interaction relationships.

7292 Welded Joint Design for Economy in Structural Fabrication and Erection. Omer Blodgett. *Welding Journal,* v. 36, Feb. 1957, p. 118-127.

To reduce labor and overhead costs, joints must be designed for minimum and maximum welding speeds.

7293 An Investigation of Welded Open-Web Expanded Beams. M. D. Altfillisch, B. R. Cooke, and A. A. Toprac. *Welding Journal,* v. 36, Feb. 1957, p. 77s-88s.

Investigation of three open-web expanded beams and deflections in the elastic range.

See also: **6352** (fatigue in aircraft structures); **6845** (vibrations in beams); **6871** (feedback control of industrial drives); **6890** (dynamic balancing machine); **7708** (drive speed control); **7805** (stresses on plywood).

METALLURGY

7294 Beryllium as an Aircraft Structural Material. George A. Hoffman. *Aeronautical Engineering Review,* v. 16, Feb. 1957, p. 50-55, 82.

Properties of Be. Problems still to be solved, particularly brittleness. Economic considerations.

7295* (German and French.) Aluminum in the Atomic Industry. **Aluminium in der Atomindustrie.** Jürg Staehelin. *Aluminium Suisse,* v. 7, Jan. 1957, p. 23-28.

Advantages of using Al in atomic reactors. Applications in machines for handling radioactive substances.

7296* 1956 Supplement to Book of ASTM Standards Including Tentatives. I. Ferrous Metals. *American Society for Testing Materials (Supplement),* 1956, 447 p.

Methods of testing and specifications for steels, welding electrodes and rods, wrought and cast irons, and metal powder products.

7297 Semi-Annual Summary Research Report in Metallurgy for January-June, 1956. *Ames Laboratory (U. S. Atomic Energy Commission),* ISC-759, Jan. 1957, 42 p. (UF767 Un3.1is Contin.)

Purification and separation studies; preparation of pure compounds; metal preparation studies; alloy systems; metal coatings and corrosion; solid state investigations.

7298* (Russian.) A New Cemented Boron Structural Steel. **Novaia konstruktsionnaia tsementuemaia stal; legirovannaia boron.** A. M. Tarasov. *Avtomobil'naia i Traktornaia Promyshlennost',* no. 12, Dec. 1956, p. 34-38.

Chemical composition and physical and mechanical properties of low alloy Cr-Mn steel 20 KhG with added B, and its technical and economic advantages compared with 20KhNM steel.

7299 Molybdenum Combats High Temperature. *Chemical Engineering,* v. 64, Mar. 1956, p. 298 + 4 pages.

Properties, commercial availability, metallizing, applications, and coating techniques.

7300 Metallurgy. A. W. Schlechten. *Engineering and Mining Journal,* v. 158, Feb. 1957, p. 128-131.

Some 1956 advances in separation, smelting, and refining, with particular reference to U, Zn, and Fe ores.

7301* (German.) Acid Resistant Gray Iron Based on a Higher Si Content. **Säurebeständiger Grauguss auf der Basis höherer Si-Gehalte.** Harry Ulbricht. *Giessereitechnik,* v. 2, Dec. 1956, p. 272-275.

Production, characteristics, and applications of acid-resistant castings.

7302 Steel Castings Shrug Off Wear and Impact Abuse. C. G. Mickelson. *Iron Age,* v. 179, Feb. 21, 1957, p. 100-101.

"Wearpact" steel wears out slowly and evenly, is magnetic, can be welded by conventional arc techniques, and can be machined with carbide tooling.

7303 Molybdenum for High Strength at High Temperatures. Robert R. Freeman and J. Z. Briggs. *Jet Propulsion,* v. 27, pt. 1, Feb. 1957, p. 138-147.

Properties; effect of composition and processing; protective coatings; fabrication and joining; applications in the jet propulsion field.

7304 Magnesium-Thorium Alloys: An Evaluation of Their Properties and Characteristics. Donald Mathews. *Magnesium,* Feb. 1957, p. 4 + 10 pages.

Recommended uses in guided missle airframe construction.

7305 Could Beryllium Be Used as a Structural Material? George A. Hoffman. *Materials & Methods,* v. 45, Feb. 1957, p. 100-103.

Brittleness is the greatest drawback to use in aircraft.

7306 Close Tolerance Wrought Iron Tubing. H. K. Siefers, Jr. *Materials & Methods,* v. 45, Feb. 1957, p. 116-117.

Corrosion resistance of wrought iron can now be used in applications that previously were not feasible.

7307 Magnesium Forming. R. G. Wilkinson. *Metal Industry,* v. 90, Feb. 1, 1957, p. 83-86.

Hot working; surface protection; assembly; applications.

7308 Aluminium and Its Alloys in 1956. Some Aspects of Research and Technical Progress Reported. E. Elliott. *Metallurgia,* v. 55, Feb. 1957, p. 67-78.

Reviews work published in Great Britain and the U. S. A. on technical progress in various aspects of the metallurgy of Al and its alloys.

7309 Metallurgy of the Rarer Metals. v. V. Molybdenum. L. Northcott. 222 p. 1956. Butterworths Scientific Publications, London. (TN798 M56)

History, occurrence, and uses; extraction; properties; powder metallurgy; alloys; oxidation and protection; joining.

7310 Non-Nuclear Uses of Thorium. W. C. Lilliendahl. *Metal Progress*, v. 71, Feb. 1957, p. 104-107.

Principal use of Th metal in industry is for alloying with Mg.

7311* (French.) Outlines of Development for High-Strength Steels. **Orientation et développement d'aciers spéciaux de construction métallique.** E. Herzog. *Revue de Métallurgie*, v. 54, Jan. 1957, p. 23-56.

Several grades of high strength steels, low or medium alloyed, with restricted C contents (0.15%) answer modern construction requirements.

7312 (German.) Hard Iron-Chromium-Nickel Alloys at High Temperature. **Temperaturbeständige, harte Oberflächenschichten auf der Basis Eisen-Chrom-Nickel.** G. Faber. *Schweizer Archiv für Angewandte Wissenschaft und Technik*, v. 23, Jan. 1957, p. 14-19.

Use of the sigma phase as a hardening agent in hard heat-resisting alloys. Two methods for the production of surface protective layers (30 to 37% Cr, 13% Ni, and the remainder Fe.)

7313 Transactions of American Society for Metals. Ray T. Bayless, editor. v. XLVIII. 1061 p. 1956. American Society for Metals, Cleveland. (TS300 Am35t Vis.)

A compilation of technical papers dealing with numerous metallurgical aspects of a variety of metals and alloys, particularly steels.

7314 An Approach to the Study of the Effect of Rare Earth Additions to Steel by Use of Radioactive Tracer Techniques. C. S. DuMont, J. E. Gates, and C. M. Henderson. Paper from "Transactions of American Society for Metals". v. XLVIII. p. 306-319. (TS300 Am35t Vis.)

Additions of radioactive misch metal were made to an alloy of 25% Ni, 20% Cr, 3.5% Cu, and 2.5% Mo to determine the distribution of residual misch metal constituents within the alloy. Cerium and Nd ions were found dispersed throughout the matrix and were also slightly concentrated in the interdendritic zones of the as-cast material.

See also: **6345** (metals for missiles); **6530** (Ag in plant construction); **7079** (Italian steelmaking industry); **7216** (superheater alloys).

METALS—CORROSION

7315* (German.) Chemical Behavior of Aluminum Materials. **Das Chemische verhalten der Aluminium-Werkstoffe. III.** Natural Materials and Technical Items. **Naturstoffe und technische Erzeugnisse.** *Aluminium Ranshofen, Mitteilungen*, v. 4, Dec. 1956, p. 35-37.

Discusses behavior of Al and its alloys when in contact with various common materials such as water, coal, mineral oil, wood, rubber, albumin, and construction materials.

7316* (German.) Chemical Stability of Pure Aluminum. **Zur chemischen Beständigkeit von Reinstaluminium.** E. Nachtigall. *Aluminium Ranshofen, Mitteilungen*, v. 4, Dec. 1956, p. 48-50.

Stability against various chemicals. Dissolution tests in HCl and NaOH. Intercrystalline corrosion of pure Al and its Mg alloys in water and steam at over 100 C.

7317 High-Temperature Corrosion of Alloys Exposed in the Superheater of an Oil-Fired Boiler. D. W. McDowell, Jr., R. J. Raudebaugh, and W. E. Somers. *ASME, Transactions*, v. 79, Feb. 1957, p. 319-328.

Data from 30 test specimens.

7318* (German.) Corrosion Studies. **Korrosionsstudium. VIII.** Effect of Temperature and Potentials of Certain Metals. **Temperaturabhängigkeit der Potentiale Einiger Metalle.** K. Smrček, I. Sekerka, and V. Seifert. **IX.** Corrosion of Iron and Dural in Respect to the pH of the Solution. **Korrosion von Eisen und dural in Abhängigkeit Vom ph der Lösung.** K. Smrček. *Collection of Czechoslovak Chemical Communications*, v. 21, Dec. 1956, p. 1569-1583.

7319* (French.) Corrosion Prevention in High Voltage Steel Cables Under Fluid Pressure. **La protection contre la corrosion des cables haute tension en tube acier sous pression de fluide.** J. Changarnier and J. Rollin. *Corrosion et Anticorrosion*, v. 5, Jan. 1957, p. 2-9.

A survey of the technical and economical advantages of this type of high voltage cables. Seals must be perfect, and short-circuit currents must be grounded during cathodic protection. The special technique and devices used are described.

7320 Application of a Systematic Scheme for Examining Corroded Metal Specimens. J. B. Cotton and R. J. Watkins. *Corrosion Technology*, v. 4, Feb. 1957, p. 39 + 5 pages.

Various techniques are applied to examination of a Cu hot-water cylinder, Al-brass condenser tubes, Sn-coated Cu specimens, Al-bronze plug cock, Al-alloy wet pulp screen, and stainless steel wire mesh.

7321 Avoidance of Stress Corrosion in Austenitic Steel Equipment. C. Edeleanu. *Corrosion Technology*, v. 4, Feb. 1957, p. 49-52.

Failure is rapid only with concentrated chloride or caustic solutions, and only at elevated temperatures. It is more important to avoid unduly severe conditions than to select the least susceptible steel available.

7322 Caustic Cracking, Its Occurrence in Steam Boilers. D. D. Jones. *Corrosion Technology*, v. 4, Feb. 1957, p. 56-59.

Causal theories; the course of corrosion; boiler plate experiments; types of attack; prevention; intercrystalline cracking; embrittlement detector; effect of steel quality.

7323* (Russian.) The Electrochemical Behavior of Stainless Steel in a Sulfuric Acid Solution. **Elektrokhimicheskoe povedenie nerzhaveiushchei stali v rastvore sernoi kisloty.** N. Ia. Bune and Ia. M. Kolotyrkin. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 11, 1956, p. 1050-1053.

Results of tests using a potentiostatic method for studying electrochemical and corrosion behavior of stainless steel (type IKh 18N12T) in a solution of 1.0N H_2SO_4.

7324* (English.) **Electrochemical Corrosion in Relation to Engineering Design.** S. L. Chawla. *Electrochemical Society, Bulletin of India Section*, v. 5, Oct. 1956, p. 77-82.

Factors leading to galvanic corrosion and their practical implications. Protective measures.

7325 Thermogalvanic Potentials and Currents at Aluminum Surfaces in Industrial Water. Edgar C. Pitzer. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 70-74.

Potentials and galvanic currents at 28 Al surfaces in Columbia River water were studied between room temperature and 100 C. The Al potential changed by approximately 0.6 v., becoming more anodic with increase in temperature.

7326 Stress-Corrosion of Wrough Ternary and Complex Alloys of the Aluminium-Zinc-Magnesium System. R. Chadwick, N. B. Muir, and H. B. Grainger. *Institute of Metals, Journal*, v. 85, Jan. 1957, p. 161-170 + 4 plates.

Stress/time-to-failure relationships were established for 16 alloys, each in two conditions of heat-treatment.

7327 Effect of Alternate Corrosion and Abrasion on Some Ferrous Metals. J. Dearden and J. D. Swindale. *Iron and Steel Institute, Journal*, v. 185, Feb. 1957, p. 227-234.

Resistance to corrosion was reduced by abrading the rust, and increasing frequency of abrasion increased the corrosion rate, except for gray cast iron. Resistance to abrasion alone was found to be related to a defined equivalent carbon content of the steels tested rather than to their hardness. Three white cast irons showed exceptional resistance to corrosion, even when combined with abrasion, and to abrasion alone.

7328* (Russian.) The Corrosion Resistance of Steel 1Kh18N9T. **O korrozionnoi ustoichivosti stali 1KH18N9T.** E. I. Astrov. *Metallovedenie i Obrabotka Metallov*, no. 1, Jan. 1957, p. 30-34.

Studies of corrosion resistance of stainless steel of the composition: C, Mn, Si, Cr, Ni, and Ti. Intercrystalline corrosion failure is determined chiefly by the ratio of TiC; as the value of this ratio goes up, corrosion goes down.

7329 A Study of Current Distribution in Cathodic Protection. E. E. Nelson. *Naval Research Laboratory, Report* 4868, Jan. 1957, 11 p. (T21 Un3.5n Contin.)

Effects of solution resistance and cathodic polarization. Advantages of good paint coatings.

7330 The Standard Salt-Spray Test—Is It a Valid Acceptance Test? A. Mendizza. *Plating*, v. 44, Feb. 1957, p. 166-175.

Standard test results were found lacking in reproducibility.

7331* (Norwegian.) Corrosion and Deposit Caused by Flue Gas in Firing Installations. **Problemer med korrosjon og belegg på røkgassiden i fyringssystemer.** Per Bergan. *Teknisk Ukeblad*, v. 104, Jan. 31, 1957, p. 81-87.

Problems created by the presence of S and mineral elements in fuels. The use of dolomite gave good results in the case of corrosion and deposits at high and low temperature.

7332 The Relative Corrosion Resistance of Titanium and Some of Its Alloys. Lex B. Golden, Walter L. Acherman, and David Schlain. *U. S. Bureau of Mines, Report of Investigations* 5299, Jan. 1957, 25 p. (TN21 Un3r)

Tests were carried out in H_2SO_4, HCl, H_3PO_4, HNO_3, mixed acids, and in chloride solutions.

7333* (Croatian.) Investigation of the Anodic Passivation of Iron in Dilute Acid Solutions. **Ispitivanje anodicnog pasiviteta zeljeza u slabo kiselim otopinama. I.** B. Lovreček and K. Bošnjak-Moslavac. *Zastita Materijala*, v. 5, Jan. 1957, p. 9-11.

See also: **7395** (corrosion fatigue); **7508** (prevention of oxidation of refractory alloys).

METALS—EXTRACTION AND REFINING

7334* (French.) Application of Radioelements to the Study of Aluminum and Iron Purification. **Application des radioéléments a l'étude de la purification très poussée de l'aluminium et du fer.** Philippe Albert. *Annales de Chimie (Paris)*, v. 1, Nov.-Dec. 1956, p. 827-896.

A systematic analysis of Al after irradiation in an atomic pile was developed, and its purification determined by the "zone melting" method. Iron was analyzed after irradiation by neutrons, and the best conditions for pure Fe preparation by electrolysis were refined; 0.1 p.p.m. of C was detected in Fe.

7335 Stora's Kal-do Rotary Oxygen Steelmaking Process. Bo Kalling and Folke Johansson. *Blast Furnace and Steel Plant*, v. 45, Feb. 1957, p. 200-203.

Oxygen is introduced into the rapidly rotating furnace through a central opening in one end, which also simultaneously serves as an outlet for the exhaust gases.

7336 Roof Performance in the Third Campaign of an All-Basic Open-Hearth Furnace. G. R. Rigby and H. M. Richardson. *British Ceramic Society, Transactions*, v. 56, Jan. 1957, p. 22-36.

Results of chemical, X-ray, and petrological examinations after a record life of 2,205 heats.

7337* (Czech.) New Method of Calculating Induction Furnaces for Steel Melting. **Nový způsob výpočtu indukční pece na tavení oceli.** Emil Langer. *Elektrotechnický Obzor*, v. 46, Jan. 1957, p. 22-29.

Calculation based on the magnetic flux in the furnace coil.

7338* (Czech.) Automatic Control of the Open-Hearth Furnace. **Automatická regulace martinových pecí.** Miloslav Gottwald. *Hutník*, v. 7, Jan. 1957, p. 8-14.

A comparison of present types of automatic control. Effects of automation on economy and yield.

7339 Open Hearth Furnace Liquid Fuel Combustion. *Industrial Heating*, v. 24, Feb. 1957, p. 310 + 5 pages.

Furnace construction and operation.

7340 The Zone-Refining of Impure Copper. E. D. Tolmie and D. A. Robins. *Institute of Metals, Journal*, v. 85, Jan. 1957, p. 171-176.

The phase diagrams of Cu binary systems may be used to estimate the segregation characteristics of alloying elements during zone-refining of dilute Cu alloys.

7341* (Spanish.) The Electric Induction Furnace Operating at Commercial Frequency for Producing Cast Iron. **El horno electrico de induccion, de frecuencia industrial para la obtencion de hierro fundido.** Giacomo Aldo Tagliaferri. *Instituto del Hierro y del Acero*, v. 9, Oct.-Dec. 1956, p. 1067-1080.

A study of L. F. induction furnaces for melting steel, Al, light alloys, Cu, and Cu alloys. Technical and economic data.

7342* (Spanish.) Steel Production by Using the Excess Gases From an Iron Sponge Plant. **Obtencion de acero empleando los gases sobrantes de una planta productora de esponja de hierro.** Guillermo Coll G. Trevijano, Marcial Espinosa Cilla, and Juan Jose Jauregui Epalza. *Instituto del Hierro y del Acero*, v. 9, Oct.-Dec. 1956, p. 1081-1119.

Reduction of iron ore with an industrial gas obtained in a gas generator blown with oxygen for the production of iron sponge. An open-hearth furnace was heated with the excess gas produced. Types of charge are described.

7343 (French.) Application of Continuous Measure of Bath Temperature to the Refining Process in the Thomas Converter. **Application de la mesure continue de la température du bain à la conduite de l'affinage au convertisseur Thomas.** B. Trentini, P. Leroy, and M. Gombert. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 125, Oct. 1956, p. 62-87. (Reprinted from *La Documentation Métallurgique*, no. 1, June 1956, p. 62-87. (TN602 In7p Vis.)

7344 (French.) A New Contribution to the Making of Open-Hearth Steel With Low Metalloid Content. **Nouvelle contribution à lélaboration d'acier Thomas à basses teneurs en métalloides (BTM).** P. Leroy, B. Trentini, and E. Devernay. *Institut de Recherches de la Sidérurgie, Publications*, ser. A, no. 124, Feb. 1957, p. 12-61. (Reprinted from *La Documentation Métallurgique*, no. 1, June 1956, p. 12-61.) (TN602 In7p Vis.)

A study of the principal factors affecting the final composition of extra-soft open-hearth steels with low metalloid content (0.005% and 0.007% N, less than 0.035% P, and less than 0.030% S).

7345 Basic Bessemer Phosphorus. Relationship With Fe in Slag and O_2 During Final Blow. H. v. Ende and G. Mahn. *Iron & Steel*, v. 30, Feb. 1957, p. 61-63. (Translated from *Stahl und Eisen*, v. 76, no. 7, 1956, p. 390-393.)

7346 The All-Basic Open Hearth Furnace. R. P. Heuer and M. A. Fay. *Iron and Steel Engineer*, v. 34, Feb. 1957, p. 95-118.

Construction and operation. Such units permit higher heat input rates, higher temperatures, and faster reversals. Longer refractory life gives greater furnace availability.

7347 A Pneumatic Level Indicator for the Continuous Casting Process. A. G. Grimshaw and B. O. Smith. *Iron and Steel Institute, Journal*, v. 185, Feb. 1957, p. 235-237.

Level indicator provides an electrical output signal which could be used to control either the rate of pouring or the rate of withdrawal of the ingot.

7348 Engineering Aspects of Modern Basic Bessemer Plants. C. Herrmann. *Iron and Steel Institute, Journal*, v. 185, Feb. 1957, p. 242-263.

Plant layout; converter shape and design; converter tilting drive; regulating system; slag treatment; water-gas purifying plants.

7349 X-Ray Studies on the Formation of Copper-Nickel Alloys From the Precipitated Basic Carbonates. W. Keith Hall and Leroy Alexander. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 242-244.

Even when two oxidic phases are present, on reduction a single metallic phase is formed in which compositional variations, if present at all, cannot exceed 3%. The oxidic phases appear to be pure CuO and an NiO phase in which up to 35% of the Ni atoms have been substituted by Cu.

7350 Pyrometallurgical Processes for Thorium-Uranium Fuel. A. G. Buyers and E. E. Motta. *North American Aviation, Inc. (U. S. Atomic Energy Commission),* NAA-SR-1710, Feb. 1957, 34 p. (UF767 Un3.1na Contin.)

The de Boer iodide refining process will remove Cs, Sr, Ce, rare earths, and Ru. Volatilization will remove Cs, Sr, Te, Ce and rare earths. Solid and liquid oxide slagging and salt bed decontamination were also studied.

7351* (German.) Ladle Brick and Casting Pit Material. **Pfannensteine und Giessgrubenmaterial.** Rudolf Rasch. *Sprechsaal,* v. 90, Jan. 1957, p. 43-47.

Surveys composition, preparation, properties, and applications of these refractories, and describes effects of charge composition and other factors on service life. Evaluates properties of various bodies in terms of phases in the FeO-MnO-SiO_2, FeO-MnO-Al_2O_3, and CaO-SiO_2-Al_2O_3 systems.

7352 Oxygen Speeds Sulphur Removal. *Steel,* v. 140, Feb. 18, 1957, p. 158, 161.

A slag control method for open-hearth refining. Big advantage is shorter refining time.

7353 Maintaining the Open Hearth. *Steel,* v. 140, Mar. 4, 1957, p. 102 + 5 pages.

Information on repairing breakouts, bottom damage, tap and flush holes, roof, and other superstructures.

7354* (Polish.) Operation of the Bell and Hopper in the Blast Furnace. **Praca wielkopiecowego rozdzielacza wsadu.** Władysław Sabela. *Wiadomości Hutnicze,* v. 12, Dec. 1956, p. 358-360.

Defects in operation and how to find them.

7355* (German.) Formation Mechanism of Alloys Without Mercury During Amalgam Reactions. **Über den Bildungsmechanismus quecksilberfreier Legierungen bei Amalgamreaktionen.** Franz Lihl and Herbert Kirnbauer. *Zeitschrift für Metallkunde,* v. 48, Jan. 1957, p. 9-15.

A study of the amalgam process: classification, binary amalgam combinations, decompositions, formation of the alloy in Hg. Thermodynamic equilibrium of alloys without Hg.

7356* (German.) Purification of Substance by Growth of Single Crystals From the Smelt and Distribution of Impurities in the Crystal. **Zur Reinigung von Stoffen durch Züchtung von Einkristallen aus der Schmelze und zur Verteilung der Beimengungen im Kristall.** Günter Schreiber and Rolf Schubert. *Zeitschrift für Physikalische Chemie (Leipzig),* v. 206, Nov. 1956, p. 102-123.

The basic methods of growing single crystals from melts are described and divided in two groups: a residual smelt process and zone melting. The first method is more effective.

See also: **6504** (open-hearth refractories); **7132** (heat transfer in open-hearth furnace); **7204** (photographing interior of steel-making furnace).

METALS—FINISHING, POLISHING, AND CLEANING

7357 Chelating Agents in Metal Cleaning and De-Rusting. J. K. Aiken and C. Garnett. *Electroplating and Metal Finishing,* v. 10, Feb. 1957, p. 31-35.

Ethylene diamine tetracetic acid chelating agents can "dissolve" water-insoluble metal oxides and hydroxides, carbonates, sulfates and phosphates which are formed when metals corrode. They are thus valuable in special-purpose cleaning compositions for metals and also as an additive to conventional alkaline cleaners.

7358* (Czech.) Scale Removal by Pickling. **Odstraňovanie okují morením.** Fridrich Matzinger. *Hutník,* v. 7, Jan. 1957, p. 22-24.

A physical-chemical explanation of the reactions taking place. An understanding of the processes permits improvements and economies in the process.

7359 The Cleaning of Hard Surfaces by Alkaline Solution. M. Camp and J. P. Parke. *Industrial Chemist,* v. 33, Feb. 1957, p. 83-86.

The essential function of alkalis in industrial cleaning is to react with and remove adsorbed layers of fatty acids which cause oily soil to adhere to hard surfaces. Sodium metasilicate is superior to caustic soda on glass and metal surfaces.

7360 Why Centerless Brushing Finishes Faster. R. C. Sasena. *Iron Age,* v. 179, Feb. 21, 1957, p. 91-93.

Power brushing without centering chucks cuts loading and unloading time sharply. Parts are finished to a few microinches at low cost.

7361 Industrial Honing. III. D. Warburton-Brown. *Machinery Lloyd (Overseas Ed.),* v. 29, Jan. 19, 1957, p. 69-75.

Honing fluids; stock removal; honing tools.

7362 Avoiding De-Wetting of Tin Coatings. C. Chevalier. *Tin and Its Uses,* no. 38, Spring 1957, p. 4-5.

Advantages of nitric acid pickling.

7363 Hydrogen Contamination in Descaling and Acid Pickling of Titanium. G. A. Lenning, C. M. Craighead, and R. I. Jaffee. Paper from "Transactions of American Society for Metals". v. XLVIII. p. 726-741. (TS300 AM35t Vis.)

Significant H absorption in Ti can occur in a NaH descaling bath and in a 10% HNO_3-2% HF pickle. The amount of H absorbed increased with increasing ratio of surface area to mass and also with time in the baths. No H pickup occurred with the Virgo bath, but this treatment resulted in surface pitting.

7364* (Polish.) Pickling Steel in Salt Baths. **Wytrawianie stali w stopionych solach.** F. Gąsior. *Wiadomości Hutnicze,* v. 12, Dec. 1956, p. 367-370.

Discussion of the pickling reaction in salt baths. Description of installation and equipment.

METALS—FOUNDRY PRACTICE

7365* (French.) Study of Factors Affecting the Casting of Heating Equipment. **Étude des facteurs intervenant dans l'usinage de la fonte d'appareils de chauffage.** M. Claude Riotte. *Fonderie,* no. 132, Jan. 1957, p. 29-33.

Casting of burners for gas heaters.

7366* (French.) The Index of Acidity of Slags and Its Application to Copper Alloy Casting. **L'indice d'acidité des laitiers et son emploi en fonderie d'alliages de cuivre.** *Fonderie,* no. 132, Jan. 1957, p. 34-37.

A study of the use of fluxes for phosphor and Pb bronzes and brass. The quality of operation was emphasized in order to determine the optimum flux percentage.

7367 Deoxidizing With Titanium Eliminates Pin Holes. R. D. Ahles. *Foundry,* v. 85, Mar. 1957, p. 112.

Metal for high-temperature and pressure application castings can be deoxidized with Ti with little or no sacrifice in mechanical properties. Appreciable cost reductions are achieved by reducing scrap castings and minimizing defect repairs.

7368 Planning a Layout for the Brass Foundry. Harry St John. *Foundry,* v. 85, Mar. 1957, p. 113-115.

Suggested layout for a foundry averaging 5,000 lb. of rough castings daily.

7369 Investment "X" Process Makes Larger Investment Castings Possible. *Foundry,* v. 85, Mar. 1957, p. 116-119.

English investment caster has developed a lost-wax technique that shows promise for producing large investment castings.

7370 CO_2 Cores and Shell Molds a Modern Production Team. Robert H. Herrmann. *Foundry*, v. 85, Mar. 1957, p. 128-129.

These new production methods are combined in an efficient setup for making small-size nonferrous castings in quantities on a jobbing basis. Automatic machines are a feature.

7371 Crucible Melting—Review of the Present Stage of Development. D. W. Brown. *Foundry Trade Journal*, v. 102, Jan. 24, 1957, p. 97-103.

Types of furnaces; supercharge pre-heating; melt quality; metal and crucible reactions; metal losses.

7372 Production Factors Contributing to High-Quality Grey Iron. A. W. Schneble. *Foundry Trade Journal*, v. 102, Jan. 31, 1957, p. 131-134.

American methods and equipment used for quality control.

7373* Moulding Characteristics of Madras Silica Sand. B. V. Somayajulu and B. R. Nijhawan. *Journal of Scientific & Industrial Research*, v. 15, sec. A, Nov. 1956, p. 508-513.

May be suitable for medium and heavy steel castings, both in the green and dried states, but a finer grade will be required for light castings.

7374* (Russian.) A New Method of Casting Thin-Walled, Large-Size Articles. **Novyi sposob lit'ia tonkostennykh krupnogabaritnykh detalei.** N. N. Rubtsov and E. S. Stebakov. *Liteinoe Proizvodstvo*, no. 12, Dec. 1956, p. 8-10.

Methods for making inexpensive thin-walled castings to replace more expensive rolled, drawn, or pressed articles.

7375* (Russian.) Analytical Solutions of Problems in the Solidification of Variously Shaped Castings. **Analiticheskie resheniia prosteishikh zadach o zatverdevanii otlivok raznoi konfiguratsii.** N. G. Girshovich and Iu. A. Nekhendzi. *Liteinoe Proizvodstvo*, no. 12, Dec. 1956, p. 13-18.

Derivation of formulas and a nomogram.

7376* (Russian.) Reasons for Rapidly Melting Kh21N11-W2.5 Steel. **Obosnovanie skorostnykh plavok stali Kh21-N11W2.5.** V. V. Panin. *Liteinoe Proizvodstvo*, no. 1, Jan. 1957, p. 11-14.

Advantages are: better mechanical properties of the steel, less fuel, cheaper charge, greater ease of processing.

7377 High Strength Aluminium Casting Alloy 40-E: D.T.D. 5008. Latest Developments and Foundry Experience. J. F. Gardnr and M. R. Hinchcliffe. *Metallurgia*, v. 55, Feb. 1957, p. 79-84.

7378* Plastics. Revolution in Patternmaking. E. J. McAfee and K. A. Clinton. *Modern Castings*, v. 31, Mar. 1957, p. 37-52.

Newly-developed epoxy resins threaten to replace metal patterns. Fundamental techniques, casting and laminating methods, personnel, and equipment are summarized.

7379* (Polish.) A New Approach to the Analysis and Definition of Foundry Defects. **Nowy pogląd na analizę i określanie wad odlewów.** Józef Pribyl. *Przeglad Odlewnictwa*, v. 7, Jan. 1957, p. 7-13.

See also: **7401** (improvement in molten iron); **7452** (grinding castings); **7515** (quality control system).

METALS—HEAT TREATMENT

7380* Calculation of Activation Energies From Calorimetric Work Carried Out at a Constant Rate of Heating. J. F. Nicholas. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 425-428.

Studies of annealing of deformed metals.

7381 A Study of the Short Time Annealing of Cold Worked Zirconium. D. E. Johnson. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)* HW-41372, Feb. 1956, 33 p. (UF767 Un3.1hw Contin.)

Treatments which produced the optimum ductility conditions test were 1-min. at 750 C followed by a water quench for 25% cold worked Zr and ½-min. at 750 C followed by a water quench for 65% cold worked Zr.

7382 Basic Furnace Atmospheres and Composition Effects. C. H. Vaughan. *Industrial Heating*, v. 24, Feb. 1957, p. 248 + 6 pages.

Production of furnace atmospheres; influence on metals being treated.

7383 Symposium on Continuous Annealing on Steel Strip. Horace Drever. *Iron and Steel Engineer*, v. 34, Feb. 1957, p. 69-94.

General considerations; furnaces; mechanical equipment; electrical drives.

7384 Service Life of Metal Belts in Copper Brazing Furnaces. Fred L. Hooper. *Metal Progress*, v. 71, Feb. 1957, p. 83-85.

Belts last longer if tension is reduced, speed is increased, and the belt is reversed periodically.

7385 Types of Furnace Atmospheres. Curtis H. Vaughan. *Metal Progress*, v. 71, Feb. 1957, p. 93-96.

Six basic sources for protective atmospheres are noted.

7386 Today's Quenching Needs and How to Meet Them. S. J. Barber. *Metal Treating*, v. 8, Jan.-Feb. 1957, p. 2-6, 28-29.

Water quenching; oil quenching; types of oil used; cost factors; selection of oil; some quenching hints.

7387 Carburizing of Truck Transmission Parts Speeded With New "Mass Marquenching" Setup. E. A. Schoefer. *Metal Treating*, v. 8, Jan.-Feb. 1957, p. 10, 48-49.

Much of the treatment's success is due to extensive use of specially designed high alloy trays and furnace parts, which withstand the severe conditions of temperature, atmosphere, and thermal shock.

7388* (Czech.) Technology of Heat Processing in Some Motor Car Works Abroad. **Technologie tepelného zpracováni v některých zahraničních automobilkách.** O. Krašný. *Strojírenská Výroba*, v. 5, Jan. 1957, p. 18-26.

Modern heat treating in Soviet and Polish motor car factories.

7389 Heat Treatment of Carbon and Low-Alloy Pressure-Vessel Steels. O. R. Carpenter and C. Floyd. *Welding Journal*, v. 36, Feb. 1957, p. 67s-76s.

Code requirements, recommended heat-treatment practices, and forming procedures for pressure-vessel steels.

See also: **7003** (annealing of Ge); **7397** (heat treatment of Cr electrodeposits); **7444** (billet heating furnace); **7492** (tempering carbide steel).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

7390 The Yield Strength of Partly Ordered F.C.C. Structures. H. J. Logie. *Acta Metallurgica*, v. 5, Feb. 1957, p. 106-109.

Partly ordered alloys show a dependence of yield strength on the size of the ordered domains; the yield strength passes through a maximum in the case of Cu_3Au when the domain size is about 50 A.

7391 The Fatigue Strength of Riveted Joints. C. R. Smith. *Aircraft Engineering*, v. 29, Feb. 1957, p. 34-38.

Failures usually occur along the first row of rivets because of axial stress due to load imposed by rivets, axial stress due to load carried by other rivets, and bending stress.

7392 Temperature and Velocity Distribution and Transfer of Heat in a Liquid Metal. H. E. Brown, B. H. Amstead, and B. E. Short. *ASME, Transactions*, v. 79, Feb. 1957, p. 279-285.

Velocity and temperature distribution, eddy diffusivity, and heat-transfer in a cooled stream of turbulently-flowing Hg.

7393 Residual Stresses in Thorium Slugs. J. Walter Joseph, Jr. and John W. Walker. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission),* DP-169, Sept. 1956, 28 p. (UF767 Un3.1dp Contin.)

Residual stresses of 2000 to 8000 psi. in compression were measured at the surface of cylindrical slugs. Tensile stresses that result from thermal gradients during irradiation are partially counteracted by these residual stresses.

7394* Engineering Properties v. Composition in Simple Binary Alloys. L. M. Elijah and D. J. Mack. *Engineering Journal,* v. 40, Feb. 1957, p. 141-143.

Properties as a function of composition in the Al-Sn, Zn-Pb, Sn-Pb, and Pb-Sb systems.

7395 The Fatigue of Metals. 164 p. 1955. Institution of Metallurgists, London. (TA460 In7f)

Five lectures covering fundamental considerations, effect of notches and surface finishes, structural aspects of aircraft fatigue, corrosion fatigue, and effects of temperature.

7396* Testing Indentation and Abrasive Hardness of Hard Materials. P. Grodzinski. *Industrial Diamond Review,* v. 17, Jan. 1957, p. 7-14.

Phenomonologic and rheologic considerations. Hardness data on various materials; testing apparatus. (To be continued.)

7397 The Influence of Heat-Treatment on the Electrical Resistivity and the Thermal Conductivity of Electrodeposited Chromium. R. W. Powell and R. P. Tye. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 185-192.

The thermal and electrical conductivities are shown to increase as a result of heat-treatment.

7398 Determination of the Surface Tension of Molten Lead, Tin, and Indium by an Improved Capillary Method. D. A. Melford and T. P. Hoar. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 197-205.

7399 Strain Figures Appearing on the Surface of Copper Electrodeposits Subjected to Fatigue. M. Suzuki. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 206-208 + 3 plates.

Flecks do not occur at random positions, but appear in the region of the grain boundaries of the metal beneath. These grain boundaries run parallel to the directions of the planes of the maximum shear stress. Maximum shear strain at the surface of coatings below which no flecks occur has a certain limiting value under constant conditions of testing.

7400 Mechanical Properties of Flake Graphite Cast Irons. G. N. J. Gilbert. *Iron & Steel,* v. 30, Feb. 1957, p. 45-51.

Modulus of elasticity; Brinell hardness; relationship between chemical composition, cooling rate, and mechanical properties.

7401* (Japanese.) **The Improvement in Properties of Molten Iron. IV. The Utilization of Oxygen Blowing for Cupola Molten Iron.** Tomojiro Tottori and Michio Nishikubo. *Iron & Steel Institute of Japan, Journal,* v. 43, Jan. 1957, p. 12-17.

7402* (Japanese.) **Studies on Cementite Cracks of High Carbon Steel. II.** Toshikazu Uesugi. *Iron & Steel Institute of Japan, Journal,* v. 43, Jan. 1957, p. 48-54.

Effects of the addition of H to 1.4 C file steel, 1% C, 1.4% Cr bearing steel, and 1% C, Cr-W tool steel.

7403 The Structure, Deformation, and Fracture of Pearlite. K. E. Puttick. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 161-176.

Observations obtained by optical and electron microscopy.

7404 Work-Function Studies of Germanium Crystals Cleaned by Ion Bombardment. J. A. Dillon, Jr. and H. E. Farnsworth. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 174-184.

7405 Dislocation Damping at High Temperatures. J. Weertman. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 193-196.

Two dislocation damping mechanisms which can give rise to internal friction at high temperatures. One mechanism can explain the internal friction that is observed at high temperatures in the kc. frequency range.

7406 Compressional Creep of Tin Single Crystals. J. Weertman. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 196-197.

Two activation energies of creep were found; approximately 24,500 cal. per mole above 120 C and 12,000 cal. per mole below this temperature.

7407 Linear Dissipation in Solids. C. Lomnitz. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 201-205.

The dissipative properties of polycrystalline materials at low strain levels can be successfully correlated on the basis of simple linear assumptions. Creep behavior determines the remaining properties, such as the value of internal friction and its variation with frequency.

7408 Carbon Tantalum Internal Friction Peak. R. W. Powers and Margaret V. Doyle. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 255-258.

The internal friction peak in Ta arising from the diffusion of interstitial carbon was located at 338 C for vibration frequencies of 0.55 c.p.s. The corresponding activation energy is 39.6 kcal.

7409 Volume-Temperature Relationships in Magnesium-Cadmium Alloys. I. Thermal Expansivities in the Order-Disorder Range. II. Kinetics of the Order-Disorder Transformation in $MgCd_3$. R. A. Flinn, W. E. Wallace, and R. S. Craig. *Journal of Physical Chemistry,* v. 61, Feb. 1957, p. 234-239.

7410 Thermal Expansion of Some Nickel Alloys. Peter Hidnert. *Journal of Research, National Bureau of Standards,* v. 58, Feb. 1957, p. 89-92.

Data on Mg-Ni, Hoskins Alloy 667, Inconel, Evanohm, Monel metal, M-M-M alloy, Illium alloy, and Waspalloy. Effects of Cu, Co, and Fe additions to Ni-Cr alloys.

7411* (Russian.) Anomalies in Strength and Plasticity in the Range Between the Critical Points. **Anomaliia prochnosti i plastichnosti v mezhkriticheskom intervale.** A. G. Vasil'eva and G. I. Pogodin-Alekseev. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1957, p. 23-29.

Detailed study of the effects of temperature on steel subjected to static elongation. Also attempts to explain the nature of the anomalous changes.

7412 The Effects of Lubricants on the Surface Appearance of Aluminium After Plastic Deformation. L. H. Butler. *Metallurgia,* v. 55, Feb. 1957, p. 63-66.

Experiments show how variation of viscosity of lubricants containing no additives may influence the surface condition of Al in compression.

7413 Insuring Toughness in Forged Gun Tubes. A. Hurlich and A. F. Jones. *Metal Progress,* v. 71, Feb. 1957, p. 65-70.

Composition of steel is not specified, and heat treatments can be adjusted by the manufacturer to meet required ductility and toughness.

7414 Molybdenum as an Alloy Addition for Titanium. Harold Margolin. *Metal Progress,* v. 71, Feb. 1957, p. 86-91.

With a 7% Al, 3% Mo alloy, which has superior strength-weight properties at elevated temperatures, a useful age-hardenable alloy may be developed.

7415 Research on Cumulative Damage in Fatigue of Riveted Aluminum Alloy Joints. J. Schijve and F. A. Jacobs. *Nationaal Luchtvaartlaboratorium, Rapport* NLL-M-1999, Jan. 1956, 53 p. (TL526.N3 N.38.5r Contin.)

7416* (German.) Evidence of Internal Stresses in the Alloy 50Ni-50Fe Using Powder Patterns. **Nachweis von inneren Spannungen an der Legierung 50Ni-50Fe mit der Methode der Bitterschen Streifen.** Christa Greiner. *Naturwissenschaften,* v. 44, Jan. 1957, p. 8-9.

A method of detecting internal stresses by the magnetostriction properties of the alloy.

7417 An Analysis of the Magnetization Processes in Iron Single Crystals by an Electrical Method. R. Parker. *Philosophical Magazine,* v. 1, ser. 8, Dec. 1956, p. 1133-1146.

Döring's theory of the anisotropy of electrical resistivity of ferro-magnetics is applied.

7418 Ferromagnetic Resonance in Thin Films of Permalloy. P. E. Tannenwald and M. H. Seavey, Jr. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 377-378.

Microwave resonance measurements were made in evaporated films of thickness 760 to 1600 A. The longest relaxation, as measured by the line width, gives $T_2=3 \times 10^{-8}$ sec.

7419 Thermal Expansion of Rare Earth Metals. F. Barson, S. Legvold, and F. H. Spedding. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 418-424.

Thermal expansion measurements at temperatures up to 900 C for polycrystalline samples of La, Ce, Pr, Nd, Gd, Tb, Dy, Er, and Yb. High-temperature phase transformations are reported for Pr, Nd, and Yb.

7420 Hall Effect and Resistance of Dilute Gold-Chromium Alloys at Low Temperatures. Werner B. Teutsch and William F. Love. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 487-490.

7421 The Effect of Gamma Irradiation on the Young's Modulus of Copper. D. O. Thompson and D. K. Holmes. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 275-278.

Irradiation of Cu single crystals causes an increase in the Young's modulus and a decrease in the internal friction.

7422* (French.) Contribution to the Study of the Problem of Brittle Fractures. **Contribution à l'étude du problème des ruptures fragiles.** W. Soete. *Revue de Métallurgie*, v. 54, Jan. 1957, p. 71-79.

Shows the efficacy of the single Robertson test.

7423* The de Haas-Van Alphen Effect in Aluminium. E. M. Gunnersen. *Royal Society of London, Philosophical Transactions*, v. 249, ser. A, Jan. 1957, p. 299-320.

Effect was studied by measuring the oscillatory variation with the magnetic field of the torque on a single crystal at liquid He temperatures in fields up to 15.4 kg.

7424 The Thermal Conductivity of Germanium and Silicon Between 2 and 300° K. J. A. Carruthers, T. H. Geballe, H. M. Rosenberg, and J. M. Ziman. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 502-514.

Pure *n*-type Ge and *p*-type Ge were measured. A pure *n*-type Si single crystal and a Au-doped *p*-type Si crystal show a behavior similar to the Ge.

7425* (Slovenian.) Effect of Cementation Surface on the Process of Steel Deformation. **Vpliv cementirane površine na potek deformacije jekla.** Matija Žumer and Viktor Prosenc. *Rudarsko-Metalurški Zbornik*, no. 4, 1956, p. 327-335.

Experimental data proving effect of surface condition on internal deformation.

7426 (Czech.) Application of Plastics for Steel Sheet Ductility Tests. **Zkouška tažnosti plechu plastickou hmotou.** V. Hašek. *Strojírenství*, v. 7, Jan. 1957, p. 37-40.

Differs from conventional methods by using plastics for transferring force to the test sample.

7427* (English.) **On the Magnetic Properties of Nickel-Arsenide Type Crystals.** Tokutaro Hirone and Kengo Adachi. *Physical Society of Japan, Journal*, v. 12, Feb. 1957, p. 156-163.

7428 Progress in the Development of Creep-Resistant Zirconium Alloys. W. Chubb. Paper from "Transactions of American Society for Metals". v. XLVIII. p. 804-824. (TS300 AM35t Vis.)

Alloys of the type Zr-Sn-Mo and Zr-Al-Nb are called "peritectoid-eutectoid hybrids", and are relatively easy to fabricate, exhibit good strength and ductility at room temperature, and show promise for the development of creep-resistant alloys at 500 C.

7429 Effect of Frequency and Temperature on Fatigue of Metals. S. R. Valluri. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3972, Feb. 1957, 15 p. (TL570 Un3t)

Phenomenological considerations applied to a standard-linear-solid physical model indicated that for particular temperatures there are corresponding frequencies of fatigue stressing above which the fatigue behavior changes.

7430 Magnetic Susceptibility of Dilute Alloys of Nickel in Copper Between 2.5°K and 295°K. E. Wm. Pugh, B. R. Coles, A. Arrott, and J. E. Goldman. *Physical Review*, v. 105, ser. 2, Feb. 1, 1957, p. 814-818.

7431* (German.) The Magnetic Anisotropy Measured After Cold Rolling, of Cubic Face Centered Iron-Nickel Alloys. **Über die magnetische Walzanisotropie kubisch flächenzentrierter Eisen-Nickel-Legierungen.** Hans-Joachim Bunge and Horst Guido Müller. *Zeitschrift für Metallkunde*, v. 48, Jan. 1957, p. 26-32.

Anisotropy as a function of degree and direction of rolling as well as heat treatment.

7432* (German.) Recrystallization Effect on the Damping and Shear Modulus of Tungsten-Wires. **Einfluss der Rekristallisation auf Dämpfung und Schubmodul von Wolframdrähten.** Werner Schilling and Rolf Haspel. *Zeitschrift für Metallkunde*, v. 48, Jan. 1957, p. 32-34.

See also: **7469** (strain aging of Al alloys); **7470** (plastic bending theory); **7479** (properties of gray cast iron); **7495** (electrical behavior of Zn in Si); **7509** (electric conductivity of powders during sintering); **7688** (density of PbSe and PbTe).

METALS—MECHANICAL WORKING

7433 How to Shape Finished Airfoils From Solid Stock. Jess S. W. Davidsen. *American Machinist*, v. 101, Feb. 11, 1957, p. 104-105.

Unique three-dimensional miller produces finished shapes in a single pass through two cutting heads.

7434 Inorganic Grinding Fluids for Titanium Alloys. M. C. Shaw and C. T. Yang. *American Society of Mechanical Engineers, Paper No.* 55-SA-39, 1955, 14 p. (TJ1 Am35p Contin.)

Dilute inorganic aqueous solutions are effective grinding fluids for Ti alloys due to the formation of adsorbed layers on both the grinding wheel and freshly ground Ti surfaces. Barium was most effective for Al_2O_3 surfaces, and the phosphate radical for Ti surfaces.

7435* Analysis of Tandem Cold Reduction Mill With Automatic Guage Control. R. A. Phillips. *Applications and Industry*, no. 28, Jan. 1957, p. 355-363, 370-374.

Integrated gage control system; derivation of transient equations for describing mathematically the tandem mill rolling process; block diagrams.

7436* Incremental Control Equations for Tandem Rolling Mills. J. H. Courcoulas and J. M. Ham. *Applications and Industry*, no. 28, Jan. 1957, p. 363-374.

Incremental steady-state transfer equations are developed for a typical multivariable machine: the strip rolling mill. The equations are derived from the theory of plastic deformation in rolling, and the electromechanical equilibrium equations of a mill.

7437 Some Experiments on the Influence of Various Factors on Drill Performance. D. F. Galloway. *ASME, Transactions*, v. 79, Feb. 1957, p. 191-231.

Special attention is given to drill shape, and particularly to those elements, such as relief angle, point angle, and relative lip height, which can be controlled by the drill user.

7438 Draw Bench Load Calibration. M. T. McGowan, H. S. Rubenstein, and R. M. Treco. *Bridgeport Brass Company (U. S. Atomic Energy Commission)*, BRB-6, Aug. 1955, 15 p. (UF767 Un3.1br Contin.)

A draw bar load-strain curve of data obtained from strain gage measurements accurately indicates the force applied.

7439 Chemical Base Coatings for Zirconium and Zircaloy. E. J. Hennessey and A. W. Grella. *Bridgeport Brass Company (U. S. Atomic Energy Commission)*, BRB-28, Mar. 1956, 26 p. (UF767 Un3.1br Contin.)

Study of metalworking lubricants. Phosphate lubricant undercoat can be easily applied from an aqueous media, is tightly

adherent to the base metal, has a very low coefficient of friction on tool materials, and can be readily removed after use.

7440* (Czech.) The Technology of Electro-Spark Machining. **Technologie elektrojiskrového obrábění.** Jindřich Staněk. *Elektrotechnik*, v. 12, Jan. 1957, p. 2-7.

Method for machining hard materials based on the erosion of the metal by spark discharges between the tool electrode and the part being machined.

7441* Oxygen Cutting Titanium and Titanium Alloys. G. Coates. *Engineer*, v. 203, Jan. 25, 1957, p. 132-134.

Metallurgical problems; influence of alloying elements; comparison of costs; hardness data; possible applications.

7442 New Ways to Shape Metal. Francis Bello. *Fortune*, v. 55, Mar. 1957, p. 148 + 5 pages.

Processes such as bending, spinning, stretch forming, rubber pad forming, and chemical milling are described.

7443* (Czech.) Design of Rolls and Passes for the Rolling Mill. **Kalibrace a konstrukce válců blokových tratí.** Jaroslav Sklenář. *Hutník*, v. 7, Jan. 1957, p. 16-22.

The proper design of passes and the sequence of operations, considering proper taper, spread, and other factors. Compares Czech and Soviet roll design and operation.

7444 New 60-Cycle Aluminum Billet Heater for Continuous Extrusion Process. D. G. Hatchard, P. G. Simpson, and L. B. Kimbrough. *Industrial Heating*, v. 24, Feb. 1957, p. 295 + 4 pages.

Principles and advantages of induction heating; heater and control system; operation, performance, and design features.

7445* Some Experiments on the Deflections and Vibrations of Drilling Machines. D. F. Galloway. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 6, 1956, p. 207-231 + 2 plates.

Drilling machine users can minimize deflections by reducing to a minimum the height of the arm on the column, reducing to a minimum the distance between the head and column, and clamping the arm and head securely.

7446* The Vibrations of Radial-Drilling Machines Under Test and Working Conditions. S. A. Tobias and W. Fishwick. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 6, 1956, p. 232-264 + 4 plates.

7447 How Much Do Grinding Fluids Affect Wheel Performance? I. J. A. Mueller. *Iron Age*, v. 179, Feb. 28, 1957, p. 79-81.

Tests with gases, water soluble oils, and straight oils. Amount of metal removed, wheel wear, power consumed, workpiece finish, and cutting rate were measured.

7448 Edge Position Control for the Steel Strip Industry. Frank J. Markey. *Iron and Steel Engineer*, v. 34, Feb. 1957, p. 119-131.

Design of a continuous process line when edge control is applied to either the pay-off or wind-up reels, or at some other intermediate point within the process.

7449 Special Theory of Ultrasonic Machining. George E. Miller. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 149-156.

A model is proposed for the mechanism of material removal in ultrasonic machining. From this model and fundamental physical principles, a machining rate equation is derived for the special case where solid, circular tools are used in conjunction with a puddled slurry.

7450 Taper Heating of Aluminum Extrusion Billets. A. J. Mueller. *Metal Progress*, v. 71, Feb. 1957, p. 76-77.

The billet should be preheated with a temperature differential by a three-section induction coil to obtain uniform properties.

7451 General Electric's Research Metallographic Laboratory. J. B. Newkirk and A. S. Holik. *Metal Progress*, v. 71, Feb. 1957, p. 78-81.

Laboratory layout and operation. A crew of 12 examines and reports on about 520 specimens monthly.

7452* Cost Cutting With Grinding Wheels. II. Work Pressure and Wheel Selection. John A. Mueller. *Modern Castings*, v. 31, Mar. 1957, p. 34-35.

Work pressure has drastic effect on wheel life and cutting rates, particularly with softer wheels.

7453* Spinning Aluminum. J. W. Lengbridge. *Modern Metals*, v. 13, Feb. 1957, p. 64, 66, 68, 70.

Tells when, why, and how to use spinning in making aluminum parts. (To be continued.)

7454 Nuclear Effects on Machine Tools. L. N. Sparks. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1184, Dec. 1956, 66 p. (UF767 Un3.1wt Contin.)

Flying debris, not blast, created the major damage to the machines. Vulnerability appears to exist in the failure of fragile external parts. Lubricants were undamaged.

7455 Transfer-Press Tooling and Techniques. I. Light Presswork. W. Hörtig. **II. Medium Presswork.** Louis Schuler. **III. Heavy Presswork.** Melvin Verson. *Sheet Metal Industries*, v. 34, Feb. 1957, p. 85-114, 138.

History, application, and operation of the various presses.

7456 Tooling for Short-Run Production. John Waller. *Sheet Metal Industries*, v. 34, Feb. 1957, p. 115-118, 120.

Design of a Hunton Bolster unit; punch and die clearance; corner-notching and piercing tools. (To be continued.)

7457 Research Into Some Metal-Forming and Shaping Operations. W. Johnson. *Sheet Metal Industries*, v. 34, Feb. 1957, p. 121-127.

Detection and measurement of residual stresses in cold drawn tubes; impact intrusions; coining; remaining problems.

7458 Make Complex Shapes in Continuous Strips. *Steel*, v. 140, Mar. 4, 1957, p. 95-98.

Cold roll forming is being used to produce a diversity of parts, from automobile wheel rims and frames to shells for refrigerators. It is economical and produces parts having a higher strength-to-weight ratio than those which are hot rolled or extruded.

7459* Titanium Chips Can Be Broken Easily. Jens L. Wennberg. *Tool Engineer*, v. 38, Mar. 1957, p. 91-94.

Curves indicate preferred and usable chip range, also positioning for chip breaker.

7460* Power Roll Forming Cuts Production Costs. J. W. Bergman. *Tool Engineer*, v. 38, Mar. 1957, p. 99-101.

A process for forming sheet stock or preformed blanks against a rotating mandrel.

7461* Buckling Limits in Contour Forming. II. William W. Wood. *Tool Engineer*, v. 38, Mar. 1957, p. 105-113.

Formability limit curves make it possible to predict whether a curved flange can be formed without buckling.

7462* Machining High Temperature Alloys With Carbides. William E. Montgomery. *Tooling and Production*, v. 22, Feb. 1957, p. 73-78.

Relative machinability of various alloys. Forces acting on a cutting tool in operation, and practical means to resist them.

7463 Roll Planishing Improves Weld-Joint Efficiency and Quality. H. L. Meredith and B. R. Russell. *Welding Journal*, v. 36, Feb. 1957, p. 113-117.

Increased yield and tensile strengths, decreased elongation, and improved fatigue strength by roll planishing.

7464 Metal Gathering by the Resistance-Heating Process. W. F. Haessly. *Welding Journal*, v. 36, Feb. 1957, p. 132-140.

General description of the process, techniques involved, and its application.

7465* Ultrasonic Impact Grinding Produces Precise Shaped Holes, Slots on Servo-Valves With Ease. A. E. Shumate. *Western Metals*, v. 15, Feb. 1957, p. 41-43.

Cutting or shaping hard or brittle materials. Tool vibrates 25,000 c.p.s.

7466* (Polish.) The Present Development of the Production of Ribbed, Concrete Reinforcing Rods. **Dotychczasowe osiągnięcia w dziedzinie produkcji prętów żebrowanych do zbrojenia betonu.** Edward Decowski. *Wiadomości Hutnicze*, v. 12, Dec. 1956, p. 360-366.

Present day methods of making reinforcing rods; quality of steel to be used; and the contours and material of the rolls for rolling the rods.

See also: **6870** (control of rolling mills); **7098** (manufacture of precision flow-meters); **7512** (carbide cutting tools); **7609** (punch-press operation).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

7467 (English.) **X-Ray Determinations of Order and Atomic Sizes in Co-Pt Solid Solutions.** P. S. Rudman and B. L. Averbach. *Acta Metallurgica,* v. 5, Feb. 1957, p. 65-73.

7468 (English.) **Self-Diffusion in Dilute Binary Solid Solutions. II.** E. W. Hart, R. E. Hoffman, and D. Turnbull. *Acta Metallurgica,* v. 5, Feb. 1957, p. 74-76.

An analytic derivation of the relationship between the observed solvent self-diffusion coefficient and the magnitude of the solute diffusion coefficient.

7469 (English.) **Strain-Aging of Aluminum and Aluminum-Magnesium Alloys at Liquid-Air Temperatures.** A. R. C. Westwood and T. Broom. *Acta Metallurgica,* v. 5, Feb. 1957, p. 77-82.

It is probable that the strain-aging observed in superpure Al is caused by the migration of interstitials to dislocations. In Al-Mg alloys an additional contribution arises from local redistribution of solute atoms.

7470 (English.) **Dislocation Theory of Plastic Bending.** W. T. Read, Jr. *Acta Metallurgica,* v. 5, Feb. 1957, p. 83-88.

The macroscopic stress in a uniformly bent crystal is related to the dislocation density by a simple differential equation analogous to Poission's equation. Differences between bending and tension tests give information about the dislocation mechanism of deformation.

7471 (English.) **The Interaction of Solutes With Dislocation Walls.** W. W. Webb. *Acta Metallurgica,* v. 5, Feb. 1957, p. 89-96.

Calculation of the elastic interaction of solutes with dislocation walls indicates that atmospheres of excess solute atoms may form at small-angle grain boundaries but are subject to saturation effects accompanied by a distinctive temperature dependence. Moving dislocation walls may lose their solute atmospheres gradually during motion at velocities up to a critical maximum above which the atmosphere is entirely left behind.

7472 (English.) **Grain Growth in Metals.** P. Feltham. *Acta Metallurgica,* v. 5, Feb. 1957, p. 97-105.

Similarity of grain size and shape distributions facilitates the treatment of grain growth as a univariant statistical problem in which the mean rate of growth of the grains is obtained as the resultant of the surface tension-controlled rate of growth of the individual grains in the distribution.

7473 On Phase Transformations. Gaston Fischer. *American Journal of Physics,* v. 25, Feb. 1957, p. 100-108.

Formulation of definitions of the order of phase transformations for systems composed of only one substance.

7474 The Influence of Impurities on the Macromosaic Structures of Tin and Lead. H. A. Atwater and B. Chalmers. *Canadian Journal of Physics,* v. 35, Feb. 1957, p. 208-215 + 2 plates.

Properties and characteristics of arrays of low-angle boundaries which appear upon freezing of single crystals of Sn and Pb from the melt are shown to be dependent upon the amount and kind of impurities in the freezing liquid.

7475* (French.) A Study, by Electron Diffraction, of Nickel Nitridation. **Étude, par diffraction électronique, de la nitruration du nickel.** Jean-Jacques Trillat, Léa Tertian, and Christiane Lecomte. *Comptes Rendus,* v. 244, Jan. 28, 1957, p. 596-598.

At various temperatures NH_3 was caused to act on thin Ni laminas and the behavior of the cubic lattice in connection with N was studied.

7476* (Russian.) Estimation of the Spontaneous Deformation of the Lattice During Ferromagnetic Transformation. **Opredelenie spontannoi deformatsii reshetki pri ferromagnitnom prevrashchenii.** K. P. Belov and I. K. Panina. *Doklady Akademii Nauk SSSR,* v. 111, Dec. 11, 1956, p. 985-987.

A method for determining changes in the lattice of ferromagnetic materials by measuring the temperature dependence of magnetostriction properties. Measurements on Ni-Fe, N-Co-Fe, and Ni-Si alloys.

7477* (Russian.) X-Ray Determination of Heterodiffusion Coefficients in Alloys Forming Solid Substitution Solutions. **Rentgenograficheskoe opredelenie koeffitsientov geterodiffuzii v splavakh, obrazuiushchikh tverdye rastvory zameshcheniia.** B. Ia. Pines and E. F. Chaikovskii. *Doklady Akademii Nauk SSSR,* v. 111, Dec. 21, 1956, p. 1234-1237 + 1 plate.

Measurements on thin layers of materials.

7478 Structure of Chemically Deposited Nickel. A. W. Goldenstein, W. Rostoker, F. Schossberger, and G. Gutzeit. *Electrochemical Society, Journal,* v. 104, Feb. 1957, p. 104-110.

Nickel deposit is an amorphous solid. Metallographic examination revealed a dense material, free of voids, and perfect conformity to the substrate surface profile. Etching produced a lamellar structure, the variation in etching intensity being interpreted as variations in dissolved P.

7479* (French.) Effects of the Nature of the Lattice on Mechanical Properties of Unalloyed Gray Cast Iron. **Influence de la nature de la matrice sur les caractéristiques mécaniques des fontes grises non alliées.** M. Michel Ferry. *Fonderie,* no. 132, Jan. 1957, p. 15-23.

Mechanical properties of cast bars were compared with those of bars subjected to thermal treatment in order to determine the exact influence of the lattice, neglecting the effect of graphite.

7480 The Nature of Some Mechanically Polished Metal Surfaces as Evidenced by Epitaxial Phenomena. L. E. Samuels. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 177-184 + 4 plates.

Electrodeposits formed on surfaces of Cu, α-brass, Sn, Zn, Ag, and Fe, and the overgrowths of alkali halides on surfaces of Ag, are epitaxed after finish polishing by standard methods. Noncontinuity may result from the presence of local misorientations in the surface.

7481 The Constitution of the Titanium-Rich Alloys of Titanium, Aluminium, and Oxygen. T. H. Schofield and A. E. Bacon. *Institute of Metals, Journal,* v. 85, Jan. 1957, p. 193-195 + 1 plate.

7482* (Spanish.) The Effect of Small Additions of Zirconium or Titanium on the Recrystallization and Growth of the Grain of Brass Type 70:30. **El efecto de pequeñas adiciones de circonio o de titanio sobre la recristalización y crecimiento de grano del latón tipo 70:30.** Sebastian Feliú Matas. *Instituto del Hierro y del Acero,* v. 9, Oct.-Dec. 1956, p. 1039-1045.

Zirconium and Ti raised the temperature of recrystallization of brass after cold deformation, and diminished the grain size in specimens annealed at high temperatures. Zirconium gave a finer texture.

7483 Where New X-Ray Techniques Solve Old Shop Problems. *Iron Age,* v. 179, Feb. 14, 1957, p. 119-121.

X-ray diffractometer does the work of a powder camera and a microphotometer, giving information on orientation, phase changes, stresses, and composition.

7484* (Japanese.) **Thermodynamic Investigation of Non-Metallic Inclusions in Steel. II. Behavior of Titanium-, Zirconium-, and Vanadium-Nitrides and Carbides and Their Effect on Austenitic Grain Size of Steel.** Hiroshi Sawamura and Toshisada Mori. *Iron & Steel Institute of Japan, Journal,* v. 43, Jan. 1957, p. 31-38.

These nitrides and carbides are considered effective as grain growth inhibitors.

7485 The Strain Ageing of Boron-Treated Low-Carbon Steels. E. R. Morgan and J. C. Shyne. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 156-160.

Boron-treated, box-annealed, low-carbon steels containing 0.007-0.02% boron are non-aging. Consideration of economics, ingot segregation, and boron-oxygen equilibrium shows that for rimming grade open-hearth steel the most promising level of boron additions is the region of 0.007%.

7486 The Solubility of Nitrogen and Formation of Silicon Nitride in Iron-Silicon Alloys. E. T. Turkdogan and S. Ignatowicz. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 200-206.

Silicon lowers the solubility of N in α- and γ-iron, and forms a silicon nitride at N potentials much lower than those of Fe_4N.

7487 The Isothermal Transformation of Lamellar Pearlites to Austenite. M. M. Labib, A. A. Golestaneh, C. Handford, and G. Bullock. *Iron and Steel Institute, Journal,* v. 185, Feb. 1957, p. 207-215.

Relationship between interlamellar spacing, temperature, and rate of transformation. Equations expressing the relationship.

7488* (Russian.) A Contribution to the Theory of the Paramagnetic Spin Lattice Theory. **K teorii paramagnitnoi spin-reshetochnoi relaksatsii.** S. A. Al'tshuler. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia,* v. 20, Nov. 1956, p. 1207-1214.

A theoretical study of relaxation caused by magnetic interactions and exchange forces in salts having magnetic ions in the S-state.

7489 Grain Boundaries for Field Emission Microscopy. E. G. Brock. *Journal of Applied Physics,* v. 28, Feb. 1957, p. 241-244.

A process for preparing polycrystalline tungsten samples by bending a tungsten wire, etching a tip at the bend, and heating. Both large and small angle grain boundaries result.

7490* Interface Energy Studies of Some Copper-Tin Alloys Containing a Liquid Phase. A. A. Krishnan and B. Halder. *Journal of Scientific & Industrial Research,* v. 15, sec. B, Dec. 1956, p. 676-681.

The tendency for decrease in dihedral angle in the direction of gravity is demonstrated. Significance of interface energy studies in the incidence and control of intergranular failures due to the presence of a liquid phase.

7491* (Russian.) The Distribution of Magnesium in Nodular Graphite Cast Iron. **Raspredelenie magniia v chugune s sharovidnym grafitom.** I. L. Mirkin and E. P. Rikman. *Liteinoe Proizvodstvo,* no. 12, Dec. 1956, p. 22-25.

It was found that the Mg is distributed throughout the volume of the metal, but not regularly.

7492* (Russian.) The Carbide Formation Process in Tempering Carbide Steel. **Protsess karbidoobrazovaniia pri otpuske uglerodistoi stali.** B. A. Apaev. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1957, p. 2-15.

A literature survey concludes that all C steels could be divided into three rather than the usual two groups from the point of view of their carbide phase behavior.

7493* (Russian.) Diagram of the Eutectic Transformation of Cast Iron. **O vide diagrammy evtekticheskogo prevrashcheniia chuguna.** K. P. Bunin. *Metallovedenie i Obrabotka Metallov,* no. 1, Jan. 1957, p. 17-23.

An eutectic diagram which presents all the phase changes taking place during the solidification of gray, mottled, and white cast iron.

7494 Phase Diagrams in Metallurgy. Their Development and Application. Frederick N. Rhines. 340 p. 1956. McGraw-Hill, New York. (TN673 R34p)

A text for the undergraduate engineering student. Emphasizes structure and use of phase diagrams rather than their determination.

7495 Diffusion and Electrical Behavior of Zinc in Silicon. C. S. Fuller and F. J. Morin. *Physical Review,* v. 105, ser. 2, Jan. 15, 1957, p. 379-384.

In the range 1000-1300 C the diffusivity varies between 10^{-6} and 10^{-7} sq. cm. per sec. A maximum solubility of about $1.4X10^{17}$ cm^{-3} occurs at 1350 C and retrograde behavior is observed. Hall effect and conductivity measurements as functions of temperature were made.

7496* (English.) **Group-Theoretical Treatment of the Energy Bands in Metal Borides MeB_6.** Masatoshi Yamazaki. *Physical Society of Japan, Journal,* v. 12, Jan. 1957, p. 1-6.

The equation for the energy is reduced by a group-theoretical treatment of the spatial symmetry at certain special values of the wave vector.

7497* (English.) **On the Period of Out-of-Step of Ordered Alloys With Anti-Phase Domain Structure.** Kunio Fujiwara. *Physical Society of Japan, Journal,* v. 12, Jan. 1957, p. 7-13.

7498* (French.) Qualitative and Quantitative Surface Analysis of Alloy Components by Means of the Fluorescent X Radiation. **Analyse qualitative et quantitative superficielle des constituants d'un alliage au moyen du rayonnement X de fluorescence.** Claude Sautier. *Revue de Métallurgie,* v. 54, Jan. 1957, p. 1-8.

Irradiation by X-rays of a solid sample results in fluorescence which when analyzed with a quartz plate, enables identification and eventual determination of the elements.

7499 (German.) The Use of Isotopes in the Metallurgy and Metallography of Non-Ferrous Products. **Anwendung von Isotopen in Metallurgie und Metallkunde der Nichteisenmetalle.** G. Glawitsch. *Schweizer Archiv für Angewandte Wissenschaft und Technik,* v. 23, Jan. 1957, p. 24-27.

A study of the autoradiography of the spatial distribution of isotopes by the density of the plates and comparison with the etching process.

7500* (French.) Transformation Curves of French Made Steels. **Courbes de transformation des aciers de fabrication française.** G. Delbart and A. Constant. v. II. Not paged. 1956. Institut de Recherches de la Sidérurgie, France. (Tn731 D37c)

Curves for structural steels and toolsteels.

7501 Technical Papers of the Tenth Metallographic Group Meeting Held at Knolls Atomic Power Laboratory, October 24, 1955. H. P. Roth. *U. S. Atomic Energy Commission,* TID-7523 (pt. 1), Dec. 1956, 100 p. (UF767 Un3ti Contin.)

Thirteen papers on etching Th and U, inclusion counting methods for U preparation of UO_2 compacts for microscopic examination, and metallography of various metals of interest in atomic research.

7502* (German.) Electron Absorption of Thin Metal Evaporation Deposits in the Electron Microscope. **Zur Elektronenabsorption dünner Metallaufdampfschichten im Elektronenmiskroskop.** Ludwig Reimer. *Zeitschrift für Angewandte Physik,* v. 9, Jan. 1957, p. 34-38.

Effect of thickness of the deposited metal film on primary rays. Bismuth, Ag, Au, and Cu layers were investigated.

7503* (German.) Solution Etching as an Isolating Process of Structural Constituents in Industrial Metallic Materials for Examination Under the Electron Microscope. **Die Lösungsätzung als Isolierverfahren von Gefügebestandteilen in technischen Eisenwerkstoffen zur Untersuchung unter dem Elektronenmikroskop.** H. Goossens and H. K. Görlich. *Zeitschrift für Wissenschaftliche Mikroskopie und Mikroskopische Technik,* v. 63, Jan. 1957, p. 171-176.

Using electrolysis to isolate the constituent elements of iron materials in order to study their technical and physical properties by identifying their crystallographic orientation had a disturbing effect on their arrangement. A corrective and simple method is described allowing further microstructural examination by X- or electron rays.

7504* (German.) Electron Microscopic Examination of the Grain Boundaries and Intergranular Substances of Industrial Ferrous Materials by Means of a New Thin Section Method. **Elektronenoptische Untersuchung von Korngrenzen und Korngrenzenwischenstoffen in technischen Eisenwerkstoffen mit Hilfe eines neuen Dünnschliffverfahrens.** H. K. Görlich and H. Goossens. *Zeitschrift für Wissenschaftliche Mikroskopie und Mikroskopische Technik,* v. 63, Jan. 1957, p. 177-183.

The composition and structure of the intergranular substances of thin sections of ferrous material obtained by a process described here, were studied with the aid of refraction diagrams of areas smaller than 1 x 1μ.

7505* (Russian.) Study of Solubility of Titanium and the Phase Alloy Composition in the Five Component Systems: Nickel-Chromium-Tungsten-Aluminum-Titanium. **Izuchenie rastvorimosti titanai fazovogo sostava splavov v piaternoi sisteme nikel'-khrom-vol'fam-aliuminii-titan.** I. I. Kornilov, A. Ia. Snetkov, and F. M. Titov. *Zhurnal Neorganicheskoi Khimii*, v. 2, Jan. 1957, p. 160-166 + 1 plate.

Thermal, metallographic, and X-ray investigations show that Ti solubility in the five component system with a constant Cr, W, and Al-content equal to 20, 6, and 5%, respectively, at 800 to 1000 C, does not exceed 1%. Further increase in temperature increases solubility: at 1100 C it is 2%, and at 1200 C it is about 5% of Ti.

See also: **6918** (structure of Cr plate on Ni and Mo); **7403** (structure of pearlite); **7409** (transformations in Mg-Cd alloys); **7507** (structure of sintered W-Cr-Ni alloys); **7816** (austenite decomposition).

METALS—POWDER

7506* Powder Metallurgy Provides a Short Cut to Titanium Parts. Edward P. Weber. *Modern Metals*, v. 13, Feb. 1957, p. 48-50, 52.

Components with excellent properties are produced by squeezing Ti powder into dies under heat and vacuum. Several powder alloys have been developed, and dispersion hardening techniques are on the way.

7507* (French.) A Micrographic Study of Mo-Cr and W-Cr Rich Alloys of Mo-Cr-Fe and W-Cr-Ni Systems. **Etude micrographique des alliages riches en Mo-Cr et en W-Cr des systèmes Mo-Cr-Fe et W-Cr-Ni.** H. Bückle. *Revue de Métallurgie*, v. 54, Jan. 1957, p. 9-15.

Dense W-rich alloys in the W-Cr-Ni system can be prepared by sintering. The binder phase can be hardened by heat treatment.

7508* (French.) Protection Against Oxidation of Refractory Alloys by the Multiphased Diffusion Process. **Protection contre l'oxydation des alliages réfractaires par le procédé de diffusion en phases multiples.** H. Bückel. *Revue de Métallurgie*, v. 54, Jan. 1957, p. 16-22.

Examples of applications referring to the highly refractory metals as well as the Ni, Cr, and Cu based alloys.

7509* (French.) Electric Conductivity of Powders During Sintering. **Sur la conductibilité électrique des poudres en cours de frittage.** J. Martinet and S. Tacvorian. *Revue de Métallurgie*, v. 54, Jan. 1957, p. 65-70.

Phenomena which occur at temperatures below the sintering temperature are indicated by a sudden change in electric resistance of the agglomerate.

7510* (Polish.) Preparing Electrolytic Nickel Powder From Sulfate and Chloride Solutions. **Wytwarzanie elektrolitcznego proszku niklu z roztworów siarczanów i chlorków.** Marek Brafman, Adam Kanas, and Irena Pająk. *Rudi i Metale Niezelazne*, v. 1, Dec. 1956, p. 47-52.

The mechanism of Ni powder formation; various electrolytic methods that can be used; choice of electrodes; regenerating the electrolyte.

7511 (Czech.) Sintered Piston Rings. **Spékané pístni kroužky.** J. Bělák. *Strojírenství*, v. 7, Jan. 1957, p. 49-51.

Sintered rings are quite durable and possess excellent friction properties.

7512* Carbide Metallurgy Simplified. E. V. Anderlite. *Tooling and Production*, v. 22, Feb. 1957, p. 95-98.

Composition and microstructure of several carbide grades.

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

7513 Nondestructive Testing by Ultrasound: Objectives and Potentialities. Wilfred Roth. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 2-4.

A critical view of the nondestructive testing field in the light of evaluating the effect that detected structural variations have on the ability of a part to function properly.

7514 New Multiple-Sampling Plan for Quality Control. Richard M. Jacobs. *American Machinist*, v. 101, Feb. 11, 1957, p. 113-118.

Plan provides for lower administrative costs, closer supervision, faster scheduling, past-performance record, and recurring-defects record.

7515 The Average-Job Quality Control System. Kenneth M. Smith. *Foundry*, v. 85, Mar. 1957, p. 123-127.

A system for keeping scrap under control in a foundry.

7516* (English.) **Non-Destructive Method of Detection of Rotten State in Standing Trees and Wood Materials Utilizing Radioactive Isotopes.** Saburo Sakamoto and Noriyoshi Iizuka. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1956, p. 117-127.

Cobalt-60 γ-rays are used.

7517 New Fields for Quality Control. R. M. Belbin. *Metal Industry*, v. 90, Jan. 25, 1957, p. 63-65.

Methods for assessing and improving inspection efficiency.

7518* (German.) A Mechanical Non-Destructive Process for Testing Plastics. **Ein Verfahren zur zerstörungsfreien mechanischen Prüfung von Kunststoffen.** F. Beér. *VDI Zeitschrift*, v. 99, Feb. 1957, p. 130.

To measure the natural frequencies and the damping capacity of plastics, a rod was subjected to a continuous stress (heat), and a special device described here was applied at time intervals.

7519* (German.) Recognizing Flaws in Non-Destructive Testing of Steel With High Energy X-Rays. **Die Fehlererkennbarkeit bei der zerstörungsfreien Prüfung von Stahl mit energiereichen Röntgenstrahlen.** R. Schittenhelm. *Zeitschrift für Angewandte Physik*, v. 8, Dec. 1956, p. 569-577.

How to interpret contrast in the film resulting from difference in intensity. Discusses irradiation with energies from 100 k.e.v. to 100 m.e.v.

See also: **7372** (quality control in iron foundry).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

7520 Classical Model of *K* Capture Inner Bremsstrahlung. Rolf G. Winter. *American Journal of Physics*, v. 25, Feb. 1957, p. 79-80.

Quantum calculations.

7521 Duration of Atomic Collisions. Otto Oldenberg. *American Journal of Physics*, v. 25, Feb. 1957, p. 94-97.

The mechanics of eccentric collisions and their effect on duration.

7522 Atom Harvest. Leonard Bertin. 253 p. 1955. Secker & Warburg, Ltd., London. (HD9698.G72 B46a)

Non-technical history of work in England on atomic bombs and other nuclear devices.

7523 Atomic Energy for Your Business. Today's Key to Tomorrow's Profits. Arnold Kramish and Eugene M. Zuckert. 269 p. 1956. David McKay Co., New York. (QC792 K86a)

After a brief, non-technical review of historical developments in atomic physics, the authors describe the production of special materials like Zr and fluorocarbons, and the applications of radioisotopes, radiation chemistry, food sterilization, etc. They also supply concrete examples of the ways in which atomic energy is being used by specific companies, and offer practical advice to every businessman on how to obtain more specific and detailed information relating to his business.

7524 Enrico Fermi Fast Breeder Reactor Plant. *Atomic Power Development Associates, Inc. (U. S. Atomic Energy Commission)*, APDA-115, Nov. 1956, 107 p. (UF767 Un3.1apd Contin.)

A description of the Enrico Fermi Atomic Power Plant, with emphasis on the reactor system.

7525* Liquid Metals and Nuclear Power. I. C. D. Boadle. *Atomics & Nuclear Energy*, v. 8, Feb. 1957, p. 41-45.

Survey of use of liquid metals as a means of high temperature heat extraction from nuclear reactors. (To be continued.)

7526* The French Approach to Power Reactors. The G2 and G3 Double-Purpose Reactors. A. Ertaud. *Atomics & Nuclear Energy*, v. 8, Feb. 1957, p. 52-59.

Uranium-fueled graphite reactors feature use of prestressed concrete for erection of the pressurized vessel containing the active block, and a loading and unloading system when the reactor is in operation.

7527 Atoms and People. Ralph E. Lapp. 304 p. 1956. Harper & Brothers, New York. (QC792 L31a)

History of atomic developments in the U. S. Preparation and testing of atomic bombs. Peaceful applications of atomic energy.

7528* (German.) Reactors for All Purposes. **Reaktoren für jeden zweck.** Rudolf Schulten. *Atomwirtschaft*, v. 1, July-Aug. 1956, p. 254 + 6 pages.

Classification, comparison, and general characteristics of research and power reactors. Fissionable material used in the various types.

7529* A Model of Nuclear Shape Oscillations for γ-Transitions and Electron Excitation. L. J. Tassie. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 407-418.

Explicit expressions are obtained for four charge distributions: uniform, Gaussian, exponential, and uniform with Gaussian "edge".

7530* Neutron Experiments With a Sensitive Szilard-Chalmers Detector. R. D. Edge. *Australian Journal of Physics*, v. 9, Dec. 1956, p. 429-435.

Neutron yield from the spontaneous fission of natural U; cross section for the reaction $Li^6(\gamma,n)$ at 6.2 m.e.v., and for Be^9 $(n,2n)$; cross-over transition in Co^{60}.

7531 Search for Successive Neutron Capture Reactions on Mg^{26}, Si^{30}, and Cr^{54}. L. P. Roy and L. Yaffe. *Canadian Journal of Chemistry*, v. 35, Feb. 1957, p. 176-179.

7532 The Neutron Capture Cross Sections of Pu^{239}, Pu^{242}, and Am^{243} in the Thermal and Epicadmium Regions. J. P. Butler, M. Lounsbury, and J. S. Merritt. *Canadian Journal of Physics*, v. 35, Feb. 1957, p. 147-154.

7533 Momentum Distribution of Metallic Electrons by Positron Annihilation. A. T. Stewart. *Canadian Journal of Physics*, v. 35, Feb. 1957, p. 168-183.

The angular correlation of photons from the two-photon decay of positrons was measured for positrons annihilating in some 34 elements, mostly metals.

7534 Estimated Fission Fragment Masses. I. W. Hay and T. D. Newton. *Canadian Journal of Physics*, v. 35, Feb. 1957, p. 195-207.

Mass excess of atoms in the fission fragment region were empirically estimated by extrapolation of β-decay Q-values using the regularities found by Way and Wood.

7535 Select Best High-Temperature Coolant. W. E. Parkins. *Chemical Engineering*, v. 64, Mar. 1957, p. 253-256.

Engineering and cost information on gases, water, organic compounds, liquid metals, and alloys as coolants for high-temperature heat transfer systems.

7536 Heat Generation by Inelastic Scattering Gamma Rays. J. P. Davis. *Combustion Engineering, Inc., Reactor Development Division (U. S. Atomic Energy Commission)*, CERD-SIC-108, Apr. 1956, 8 p. (UF767 Un3.1cer Contin.)

Build-up is accounted for using the Taylor two-term exponential fit for energy absorption build-up factors.

7537 Selecting Key Instruments for Nuclear Reactors. C. C. Scott and T. A. DeBacker. *Control Engineering*, v. 4, Mar. 1957, p. 92-97.

Includes three charts for selecting neutron flux, temperature, and pressure-measuring elements.

7538* (Russian.) Scattering of 300 M.E.V. π-Mesons, Both Positive and Negative, on Hydrogen. **Rasseianie polozhitel'nykh i otritsatel'nykh π-Mezonov s energiei 300 mev na vodorode.** L. S. Dul'kova, I. B. Sokolova, and M. G. Shafranova. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 11, 1956, p. 992-995.

Studies of scattering by using thick-layer photographic film. Found 105 cases of elastic scattering of positive mesons and 149 cases of scattering of negative mesons over a range of angles from 10 to 170°.

7539* (Russian.) Elastic Scattering of γ-Quanta With Energy up to 120 M.E.V. by Protons. **Uprugoe rasseianie γ-kvantov s energiei do 120 mev protonami.** B. B. Govorkov, V. I. Gol'danskii, O. A. Karpukhin, A. V. Kutsenko, and V. V. Pavlovskaia. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 11, 1956, p. 988-991.

Discussion of Compton effect in protons; apparatus and method for measuring the angular distribution of elastic scattering.

7540* (Russian.) Photoproduction of Slow Negative π-Mesons on Complex Nuclei. **Photoobrazovanie medlennykh π-mezonov na slozhnykh iadrakh.** E. G. Gorzhevskaia and N. M. Panova. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1205-1208.

An attempt to determine if the photoproduction in a complex nucleus takes place on a nucleon or whether it is more complex, and to obtain information about the interaction between the slow meson and the residual nucleus.

7541* (Russian.) On the Annihilation of Positrons in Metals. **Ob annigiliatsii pozitronov v metallakh.** V. I. Karpman and I. Z. Fisher. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1212-1214.

Presents evidence that the positron in metal is annihilated without the formation of positronium.

7542* Scotland's First Nuclear Power Station. I. *Engineer*, v. 203, Feb. 8, 1957, p. 216-219.

Some design and construction details of proposed power station. (To be continued.)

7543 The Magneto-Ionic Expander Isotope Separator. Joseph Slepian. *Franklin Institute, Journal*, v. 263, Feb. 1957, p. 129-139.

Operation of device which offers pure isotopes of metals more cheaply than any other known method.

7544* A New Approach to the Cascade Theory. Alladi Ramakrishnan and S. K. Srinivasan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Nov. 1956, p. 263-273.

Deals with the number of particles produced in a certain thickness of matter, the energy of each particle being greater than E at the point of its production.

7545* On the Stochastic Equation for the Energy Loss of Fast Electrons in Matter. L. Bass. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 423-427.

The integral-differential equation describing the energy distribution of very fast electrons is reduced to a Volterra integral equation of the second order. A rigorous solution, for an arbitrarily prescribed boundary condition, is given in terms of a convergent expansion of the Liouville-Neumann type.

7546* The Pressurized Water Reactor as a Source of Heat for Steam Power Plants. J. M. Kay and F. J. Hutchinson. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 8, 1956, p. 281-305.

7547* The Use of Sodium and of Sodium-Potassium Alloy as a Heat-Transfer Medium. W. B. Hall and T. I. M. Crofts. *Institution of Mechanical Engineers, Proceedings*, v. 170, no. 10, 1956, p. 321-339.

An experimental plant; design and operational problems; heat-transfer measurements; cavitation problems.

7548* Control Instrumentation for Nuclear Reactors. II. *Instrument Practice*, v. 11, Jan. 1957, p. 41-46.

Detection of faulty fuel elements; inspection of fuel element channels; health instrumentation.

7549* Nuclear Power Reactor Instrumentation and Control. Walter C. Lipinski and Robert L. Ramp. *ISA Journal*, v. 4, Feb. 1957, p. 54-59.

Operation and performance of measuring, telemetering, and control systems on experimental boiling water reactor.

7550 Angular Averages in the Scattering of Slow Neutrons by Gases. Howard C. Volkin. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 184-189.

A procedure is developed for averaging over the thermal translational motion of a gas scatterer in order to obtain observed angular averages from a knowledge of the differential cross section in the center-of-mass system.

7551 Resonance Absorption of Neutrons by Uranium Cylinders. Monte V. Davis. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 250-254.

Results of reactivity measurements were interpreted to yield the effective resonance integral as a function of surface-to-mass ratio of the cylinders.

7552 Neutron Yields From Thick Targets Bombarded by 24-Mev Deuterons and 12-Mev Protons. W. E. Crandall, G. P. Millburn, and L. Schecter. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 273-276.

7553* (French.) Gamma Ray Action on Polymers in the Solid State. **Action des rayons gamma sur les polymères a l'état solide. III.** Irradiation of Polyvinyl Chloride. **Irradiation du chlorure de polyvinyle.** Adolphe Chapiro. *Journal de Chimie Physique*, v. 53, Nov.-Dec. 1956, p. 895-902.

In vacuum there was a lattice formation of the polymer with very little radiochemical production. The color and U.V. adsorption spectra were different for atmospheric or vacuum radiation.

7554* (French.) Direct and Indirect Effects of Ionizing Radiations on Aqueous Solutions. **Actions directes et indirectes des radiations ionisantes sur les solutions aqueuses.** Maurice Cottin. *Journal de Chimie Physique*, v. 53, Nov.-Dec. 1956, p. 903-928.

A study of the direct action on perchloric acid and the indirect action on phosphorus acid. Gamma-rays of radiocobalt, X-rays of 10 m.e.v., and α-rays of Po were involved; mechanisms of reaction are explained.

7555* (French.) Radiochemical Investigations on Uranium. **Recherches radiochimiques sur l'uranium. I.** Oxidation of Uranous Sulphate by γ- and X-Rays. **Oxydation du sulfate uraneux par les rayons γ et X.** M. Haïssinsky. *Journal de Chimie Physique*, v. 53, Nov.-Dec. 1956, p. 970-978.

Study of the oxidation of uranous sulphate in acid solution by γ- and X-rays in the presence and absence of air; effects of concentration, acidity, and intensity. A chain reaction is suggested and interpreted.

7556 Alpha-Decay Hindrance-Factor Calculations. Charles J. Gallagher Jr. and John O. Rasmussen. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 333-344.

Hindrance factors for all known α groups of α emitters with more than 128 neutrons and 83 protons were calculated. Results were divided into four groups corresponding to odd-odd, odd-even, even-odd, and excited states of even-even α emitters.

7557 Radiochemical Measurement of the Natural Fission Rate of Uranium and the Natural Occurrence of Ba^{140}. P. K. Kuroda and R. R. Edwards. *Journal of Inorganic and Nuclear Chemistry*, v. 3, Jan. 1957, p. 345-348.

7558* (French.) Nucleon-Nucleon Diffusion in the Presence of Non Central Forces. **Diffusion nucléon-nucléon en présence de forces non centrales. I.** Neutron-Proton Diffusion. **Diffusion neutron-proton.** M. Gourdin. *Journal de Physique et le Radium*, v. 17, Dec. 1956, p. 988-996.

A study of neutron-proton diffusion in the presence of a potential with a tensor force. An explicit calculation expresses the effective differential section of diffusion developed in the form of Legendre polynomials.

7559 Matrices of Spin-Orbit Interaction of the Electron Configuration *d*'s. W. R. Bozman and R. E. Trees. *Journal of Research, National Bureau of Standards*, v. 58, Feb. 1957, p. 95-100.

7560 Standard Ionization - Chamber Requirements for 250- to 500-Kilovolt X-Rays. H. O. Wyckoff and F. S. Kirn. *Journal of Research, National Bureau of Standards*, v. 58, Feb. 1957, p. 111-117.

7561 Note on a Theory of Minimum Weight Shields. H. Hurwitz, Jr. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1441, Jan. 1957, 15 p. (UF767 Un3.1ka Contin.)

Recipes for obtaining mathematical solution of the minimum weight problem under the assumption that the neutron distribution in the shield is determined in advance, and does not depend on the distribution of heavy material.

7562 Thorium's Role in Atomic Power. John P. Howe. *Metal Progress*, v. 71, Feb. 1957, p. 97-103.

Five major reactor projects which contemplate the use of Th are discussed.

7563 Sodium Reactor Experiment Pump Development. R. Cygan. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-Sr-1662, Jan. 1957, 37 p. (UF767 Un3.1na Contin.)

Operation of a freeze-seal type centrifugal pump was carried out at Na temperatures up to 1200 F and measurements made of cooling requirements, pressure drop, torque, temperature distribution, and reliability of the freeze seals.

7564 Proceedings of the SRE-OMRE Forum. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1804, Jan. 1957, 313 p. (UF767 Un3ti Contin.)

Papers and discussions concerning the development, construction, and operation of the Sodium Reactor and the Organic Moderated Reactor Experiments.

7565 The Behavior of Tetralin in Liquid Sodium. R. L. McKisson and K. E. Horton. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1771, Feb. 1957, 19 p. (UF767 Un3.1na Contin.)

Tetralin decomposes with rapidity in the presence of hot liquid Na. The ultimate decomposition products are H, C, and low mol. wt. aliphatic compounds.

7566 A High-Pressure $B^{10}F_3$ Loading System for a Reactor Safety Element. Charles R. F. Smith. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1782, Feb. 1957, 17 p. (UF767 Un3.1na Contin.)

The flow diagram for the system is described starting with production of the gas from $CaF_2.B^{10}F_3$ powder.

7567 Nuclear Energy in Western Europe and United States Policy. Klaus Knorr. 35 p. 1956. Center of International Studies, Princeton University. (HD9698 K75n Over.)

Analysis of several schemes for cooperative effort.

7568* The World's Reactors. IX. The South of Scotland and Electricity Board Station. *Nuclear Engineering*, v. 2, Feb. 1957, p. 52-53 + 3 plates.

Complete data sheets, including detailed cross-sectional diagrams, of reactor, turbogenerators, and steam accessories.

7569* Power From Thermonuclear Reactions. J. G. Linhart. *Nuclear Engineering*, v. 2, Feb. 1957, p. 60-65.

An analogy between the problems associated with the ignition, maintenance, and energy extraction from a chemical flame and those of a thermonuclear flame. Calculations of the main conditions to be satisfied when considering the construction of a fusion reactor.

7570* Merlin—Medium Flux Research Reactor. II. D. R. Chick and A. J. Salmon. *Nuclear Engineering*, v. 2, Feb. 1957, p. 66-71.

Safety aspects of the design; control and instrumentation system; safety precautions for core adjustment and maintenance; fission-product activity and effluent disposal; operating program.

7571* Regenerative Action in High Energy Accelerators. Stanley Cohen and Albert V. Crewe. *Nuclear Instruments*, v. 1, Jan. 1957, p. 31-40.

The regenerative method for the extraction of particles from an accelerator can be extended to include machines other than cyclotrons. This is accomplished by the ues of modes of radial oscillations in which the regenerative action does not occur on every revolution of the particle about the machine.

7572* A Proportional Counter System With Small Wall Effect. R. W. P. Drever, A. Moljk, and S. C. Curran. *Nuclear Instruments*, v. 1, Jan. 1957, p. 41-45.

Design of wall-less counters; operation and characteristics; applications to a new measurement of the L/K-capture ratio of Ge^{71} and to low level counting.

7573* Aberrations and Fringing Effects in a 180° Double Focussing Magnetic Spectrometer. David L. Judd and Sidney A. Bludman. *Nuclear Instruments*, v. 1, Jan. 1957, p. 46-52.

The optic axis and focal points for particles of a definite momentum. Coefficients of the quadratic and cubic terms in the expansion of the magnetic field. Linear dispersion and orientation of the focal plane for paraxial trajectories of slightly different momenta.

7574* Personnel Protection Instruments for Use in Gamma Irradiation Cells. E. W. Pulsford and C. C. H. Washtell. *Nuclear Power*, v. 2, Feb. 1957, p. 58-61.

7575 Instrumentation and Controls for HRT. D. S. Toomb, Jr. *Nucleonics*, v. 15, Feb. 1957, p. 48-52.

Basic flow sheet; key control loops; plant layout; temperature, level, and pressure transmitters.

7576 Data-Handling System for Nuclear-Power Tests. Raymond A Edwards. *Nucleonics*, v. 15, Feb. 1957, p. 53-57.

Fast, accurate data-reduction system gathers transient and steady-state data needed for the design of efficient nuclear power plants.

7577 Activity Transport in Sodium-Cooled Systems. Fred G. Haag. *Nucleonics*, v. 15, Feb. 1957, p. 58-61.

Radioactivity induced in stainless steel and transported in the coolant stream can limit access to parts of a reactor system. Transfer rates are particularly sensitive to temperature and oxides. Barium is an effective inhibitor.

7578 Determining Coolant Flow in SRE Fuel Elements. W. J. Freede and T. T. Shimazaki. *Nucleonics*, v. 15, Feb. 1957, p. 64-67.

Following CCl_4-weighted sawdust photographically and $MnCl_2$ chemically in water as mock-up coolant, the flow pattern was determined for SRE fuel elements. Results show that coolant mixing is adequate for cooling fuel rods.

7579 Notes on Reactor Analysis. II. Theory. D. K. Holmes and R. V. Meghreblian. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, CF-54-7-88 (pt. 2), Aug. 1955, 453 p. (UF767 Un3.1cf Contin.)

Cross sections; neutron flux and the multiplication constant; slowing down of neutrons; transport theory and the diffusion approximation; combined slowing down and diffusion; reflected reactors; reactor kinetics; heterogeneity; perturbation theory.

7580 Indoctrination and Training of Radiological Defense Personnel. Roscoe H. Goeke. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1165, Dec. 1956, 22 p. (UF767 Un3.1wt Contin.)

Details of a three week training project.

7581 Distribution and Density of Missiles From Nuclear Explosions. I. Gerald Bowen, Allen F. Strehler, and Mead B. Wetherbe. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1168, Dec. 1956, 113 p. (UF767 Un3.1wt Contin.)

Properties of secondary missiles produced in houses, shelters, and open areas at distances of 1,470 to 10,500 ft. from a nuclear explosion with a yield approximately 50% greater than nominal.

7582 The Effect of Nuclear Explosions on Commercially Packaged Beverages. Rolland McConnell, George O. Sampson, and John M. Sharf. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1213, Jan. 1957, 18 p. (UF767 Un3.1wt Contin.)

Nominal losses were occasioned primarily by flying missiles, the crushing of structures, or dislodgment from shelves. Beverages exhibited only mild induced radioactivity, well within permissible limits for emergency use.

7583 Radiative Capture of Protons of Less Than 1 Mev in Beryllium. A. B. Clegg. *Philosophical Magazine*, v. 1, ser. 8, Dec. 1956, p. 1116-1125.

The γ-radiation at 330 k.e.v. was investigated in detail.

7584 (English.) **Investigation of Four Resonances in the Reaction $^{26}Mg(p,\gamma)^{27}Al$.** C. Van der Leun, P. M. Endt, J. C. Kluyver, and L. E. Vrenken. *Physica*, v. 22, Dec. 1956, p. 1223-1233.

The reaction is studied at 339, 454, 661, and 723 k.e.v. with a NaI scintillation spectrometer.

7585 Statistical Fluctuations in Energy Losses of 37-Mev Protons. T. J. Gooding and R. M. Eisberg. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 357-360.

The frequency distribution of energy losses of 37 m.e.v., protons was found to be in good agreement, both in shape and full width, with the predictions of Landau and Symon, for absorber thicknesses from 34 k.e.v. to 2 m.e.v.

7586 Statistical Theory of Many-Electron Systems. General Considerations Pertaining to the Thomas-Fermi Theory. Sidney Golden. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 604-615.

7587 Neutron Resonance Structure of Uranium-238. L. M. Bollinger, R. E. Coté, D. A. Dahlberg, and G. E. Thomas. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 661-665.

Modifications in the Argonne fast-neutron chopper and its installation at the reactor *CP-5*. Parameters for the resonances observed, obtained by a refined wing shape analysis as well as by the conventional area analysis.

7588 Masses of Identified Positive Heavy Mesons. James Ray Peterson. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 693-706.

The charged secondary particles from all presently known decay modes of positive *K* mesons were identified, and masses of the primaries measured by the momentum-range method.

7589* Interpretation of Radiation Results Based on Target Theory. Aadne Ore. *Radiation Research*, v. 6, Jan. 1957, p. 27-39.

Certain approximations, commonly used in the "one-hit" statistical analysis of radiation data in terms of size, shape, and sensitivity of macromolecules, are discussed quantitatively.

7590* Calorimetric Determination of the Power in a 1400 kv X-Ray Beam. John McElhinney, Bernard Zendle, and Steve R. Domen. *Radiation Research*, v. 6, Jan. 1957, p. 40-54.

The experimental conversion factor was found to be 2983 ± 69 ergs/cm³ per roentgen as compared with a theoretical value of 2985 ergs/cm³ per roentgen.

7591 Mercury Vapor Jet Target and Stripper. Robert Beringer and Waldo Rall. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 77-79.

A supersonic jet for use in stripping electrons from a beam of heavy ions.

7592 Propane Bubble Chamber in a High Magnetic Field. Larry O. Oswald. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 80-83.

Liquid propane chamber is 3.25 x 6.5 x 13 in. and operates in a magnetic field of 22,000 gauss.

7593 Energy Modulation for Particle Accelerators. L. Cranberg, W. P. Aiello, R. K. Beauchamp, H. J. Lang, and J. S. Levin. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 84-88.

The energy of an electrostatic accelerator is modulated over a range of 50 k.e.v. by applying an alternating potential of 50-k.v. amplitude to an insulated target at a frequency of 10 c.p.s.

7594 Measurement of Fast Neutron Total Cross Sections. L. Cranberg, R. K. Beauchamp, and J. S. Levin. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 89-92.

A system for measuring high resolution total neutron cross sections at high counting rate in the range above 50-k.e.v. neutron energy using as a neutron detector a thick proton recoil detector.

7595 The Stripping Theory of Deuteron Reactions and the Inelastic Scattering of Deuterons. W. M. Fairbairn. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 448-472.

The interaction between the neutron and the proton after the stripping has taken place is used to predict inelastic scattering of deuterons.

7596 Effect of a Repulsive Core in the Theory of Complex Nuclei. H. A. Bethe and J. Goldstone. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 551-567.

A spatial wave function for two nucleons is defined, and an integro-differential equation for this function derived.

7597 The Effect of *P*-State and Higher Angular Momentum Hard-Core Interaction on Nuclear Binding. D. J. Thouless. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 108-112.

The *P*-state interaction is found to have a considerable influence on binding, and is liable to reduce the calculated stable nuclear density. Higher angular momenta should have only a small influence.

7598 Experimental Power and Test Reactors. *U. S. Atomic Energy Commission*, TID-4562, Nov. 1956, 44 p. (UF767 Un3ti Contin.)

Summary of major aspects of the experimental reactor program of the U. S. Atomic Energy Commission.

7599 Compilation of Organic Moderator and Coolant Technology. I. Harry P. Smith. *U. S. Atomic Energy Commission*, TID-7007, Jan. 1957, 248 p. (UF767 Un3ti Contin.)

Papers dealing with effects of radiation on various materials, organic coolant research, use of moderators and coolants in reactors, and irradiation of diphenyl.

7600 On Commutation Relations of Interacting Spinor Fields and the Scattering and Production of K Mesons. Richard Spitzer. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3604, Nov. 1956, 89 p. (UF767 U3u Contin.)

7601 The P.A.R. Homogeneous Reactor Project. W. E. Johnson, D. H. Fax, and S. C. Townsend. *Westinghouse Engineer*, v. 7, Mar. 1957, p. 35-39.

Progress report on experimental and analytical studies leading to the design of an aqueous homogeneous reactor plant having an electrical output of 150,000 kw.

7602 (German.) Transfer Test of Solid Copper. **Überführungsversuche an festem Kupfer.** H. Wever. *Zeitschrift für Elektrochemie*, v. 60, nos. 9-10, 1956, p. 1170-1175.

The transfer caused by d.c. in the intermetallic phases of Cu was studied and interpreted. Up to a temperature of 950 C, Cu goes to the anode; above 950 C it goes in the opposite direction.

See also: **6635** (ionization chamber); **6652** (solubility of Na_2O in liquid Na); **6715** (terphenyl as moderator and coolant); **6765** (irradiation of 8-hydroxy-quinoline); **6780** (radiation effects in fuel extraction); **7078** (radiation processing economics); **7122** (effect of nuclear explosion on food); **7123** (effects of nuclear explosions on food); **7124** (effect of nuclear explosion on meat products); **7125** (effect of nuclear explosion on foods (summary); **7126** (radiation effects on foods); **7258** (radiation–resistant grease); **7393** (stresses in Th slugs); **7421** (radiation effects on Cu); **7454** (nuclear effects on machine tools); **7724** (radioactive fall-out prediction); **7725** (radioactive fall-out); **7726** (treatment of radioactive wastes); **7846** (radiological defense training); **7856** (Sr^{90} in humans).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

7603 The Aircraft Assignment Problem. Ram Vaswani. *Aeronautical Engineering Review*, v. 16, Feb. 1957, p. 64-68.

An analytic linear programing solution illustrating the application of Flood's optimal assignment technique, which is basically simple to apply and can be used routinely by clerical personnel.

7604* Data Processing Operations and Computers for Management. 72 p. 1956. Army Library, Adjutant General's Office, Washington, D. C. (Z5832 Un3.11r)

A bibliography of 500 selected titles, published mostly during the period Feb. to Sept. 1956.

7605 General Systems. Yearbook of the Society for the Advancement of General Systems Theory. Ludwig von Bertalanffy and Anatol Rapoport, editors. v. I. 162 p. 1956. American Association for the Advancement of Science, Washington, D. C. (Q175 So13g Vis.)

A collection of papers covering the scope, utility, and limitations of mathematical models in the social sciences and other human activities.

7606 Time-Study and Statistics. A. W. Swan. *Operational Research Quarterly*, v. 7, Dec. 1956, p. 110-139.

Some examples of the application of statistical thinking to time-studies, using principally the plotting of results as distributions.

7607 The Scope for Electronic Computers in the Office. 102 p. 1956. Office Management Assn., London. (HF5548 Of3s)

Papers presented at the National Conference of the Office Management Association in May 1955, describing various types of commercial computers and how they are used in British offices.

7608 Successful Office Automation. Ralph W. Fairbanks. 355 p. 1956. Prentice-Hall, Englewood Cliffs. (HF5548 F15s)

Describes available types of computers and other business machines. Points out causes of bottlenecks in office operations and shows how these bottlenecks can be eliminated by system revision in the office.

7609* Methods-Time Measurement as Applied to Punch-Press Operations. Irving H. Norton. *Tooling and Production*, v. 22, Feb. 1957, p. 99-104.

Pre-determining the most efficient motion patterns permits optimum engineering design, thus improving tool performance.

See also: **6863** (computer applications in business).

ORE AND MATERIALS BENEFICIATION

7610 The Recovery of Uranium From Phosphate Rock. R. E. Stedman. *Chemistry & Industry*, no. 6, Feb. 9, 1957, p. 150-153.

Sodium or ammonium formaldehyde sulfoxylate is the reducing agent. After extraction with hot HNO_3, the U is precipitated as ammonium uranyl phosphate. This is digested with Na_2CO_3, and ammonia is added to precipitate ammonium diuranate.

7611 Ore Dressing. James W. Franklin. *Engineering and Mining Journal*, v. 158, Feb. 1957, p. 132-136.

Top events in 1956 were wet cyclones; new equipment, techniques, and reagents; high-pressure hydrometallurgy; instrumentation. Solvent extraction, hydrometallurgy, and halogenation will make further gains in 1957.

7612 The Adaptation of New Research Techniques to Mineral Engineering Problems. *Massachusetts Institute of Technology (U. S. Atomic Energy Commission)*, NYO-7179, July 1956, 78 p. (UF767 U3ny Contin.)

Subjects of these twelve reports include flotation, surface chemistry, comminution, brittle fracture, and thickening and thickeners.

7613* Mineral Dressing in 1956. Nathaniel Herz. *Mining Congress Journal*, v. 43, Feb. 1957, p. 120 + 3 pages.

Trend is to larger, better designed mills with bigger equipment in a move to reduce milling costs. Crushing, concentration, and hydrometallurgical processes are being developed.

7614 Processing of Uranium—Magnesium Fluoride Slag. *U. S. Atomic Energy Commission*, TID-7528 (pt. 1), Dec. 1956, 80 p. (UF767 Un3ti Contin.)

Five papers on the physical properties of MgF_2 slag and processes for U recovery.

7615 Volatilization of Tin Chlorides From Slime. K. K. Kershner and A. A. Cochran. *U. S. Bureau of Mines, Report of Investigations* 5298, Jan. 1957, 10 p. (TN21 Un3r)

Use of HCl and reducing gases. Optimum conditions were found to be a mixture of 3:1H and HCl at 475 C. Over 95% of the Sn was volatilized.

See also: **7077** (treatment of Mn ores); **7186** (coal preparation).

PHYSICS

7616 Acoustic Radiation Pressure. Peter J. Westervelt. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 26-29.

An expression for the radiation force on a scattering obstacle with arbitrary normal impedance is now shown to be valid for any scattering obstacle.

7617 Acoustic Radiation From a Stationary Cylinder in a Fluid Stream (Aeolian Tones). B. Etkin, G. K. Korbacher, and R. T. Keefe. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 30-36.

Quantitative predictions of the directionality and intensity of the field.

7618 Wave Propagation in Elastic Plates: Low and High Mode Dispersion. Ivan Tolstoy and Eugene Usdin. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 37-42.

An analysis of dispersive properties of elastic plates *in vacuo*.

7619 Aerodynamic Mixing in a High-Intensity Standing-Wave Sound Field. William R. Mickelsen and Lionel V. Baldwin. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 46-49.

The effect of a transverse sound field on the temperature field downstream from a line source of heat was investigated.

7620 Scattering in an Inhomogeneous Medium. Eugen Skudrzyk. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 50-60.

7621 Effect of the Splayed Walls of a Room on the Steady-State Sound Transmission Characteristics. Tadamoto Nimura and Kimio Shibayama. *Acoustical Society of America, Journal*, v. 29, Jan. 1957, p. 85-93.

Characteristics in model rooms of various shapes were measured.

7622* Some Physical Properties of Diamonds. F. C. Champion. *Advances in Physics*, v. 5, Oct. 1956, p. 383-411.

Structural defects; theoretical considerations; growth of natural and artificial diamonds.

7623* On the Polaron Rest Energy and Effective Mass. G. R. Allcock. *Advances in Physics*, v. 5, Oct. 1956, p. 412-451.

The work to date on the polaron ground state is collated and summarized.

7624* Some Aspects of Magnetohydrodynamics. G. H. A. Cole. *Advances in Physics*, v. 5, Oct. 1956, p. 452-497.

Magnetohydrodynamic equations; magnetothermal effects; shock propagation; shock structure.

7625 Matrix Representation of Thermodynamic Fundamentals. Joseph John Kyame. *American Journal of Physics*, v. 25, Feb. 1957, p. 67-69.

Maxwell's relations and other thermodynamic derivatives are readily obtained by differentiation of the matrices defined.

7626 Moments of Inertia of Solid Rectangular Parallelopipeds, Cubes, and Two Cubes, and Two Other Regular Polyhedra. John Satterly. *American Journal of Physics*, v. 25, Feb. 1957, p. 70-78.

7627 Semi-Annual Summary Research Report in Physics for January Through June, 1956. *Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-758, Oct. 1956, 37 p. (UF767 Un3.1is Contin.)

7628* The Radial Tone Arm—An Unconventional Phonograph Pickup Suspension. H. E. Roys and E. E. Masterson. *Audio Engineering Society, Journal*, v. 4, July 1956, p. 101-104.

New method of supporting a pickup while reproducing a phonograph record permits the pickup to follow along a radial line, thus eliminating tracking error, reducing static friction, and providing mechanical resistance in a lateral direction.

7629* Permanent Magnets. II. Alun Edwards. *Electrical Energy*, v. 1, Feb. 1957, p. 178-185.

Tabulates data on the types and characteristics of permanent magnets.

7630 Ultraviolet Fluorescence of Some Ternary Silicates Activated With Lead. H. A. Klasens, A. H. Hoekstra, and A. P. M. Cox. *Electrochemical Society, Journal*, v. 104, Feb. 1957, p. 93-100.

Fluorescence and phase diagrams of the SrO-MgO-SiO_2, SrO-ZnO-SiO_2, BaO-MgO-SiO_2, and BaO-ZnO-SiO_2 systems were studied. Eleven new ternary silicates were identified, some of which proved to be very good base materials for Pb-activated phosphors with peak emissions ranging from 3000 to 4000 A.

7631* Scattering of Polarised Light by Colloids Containing Anisotropic Particles. R. S. Krishnan and S. R. Sivarajan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Nov. 1956, p. 274-278.

7632* Quantum Theory and Crystal Physics. C. V. Raman. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 361-366.

The fundamental notions of quantum theory and thermodynamics indicate that a crystal should be regarded as an assembly of an immense number of oscillators whose energy states are quantised and which form a system in thermodynamic equilibrium.

7633* The Specific Heats of Crystals. III. Analysis of the Experimental Data. C. V. Raman. *Indian Academy of Science, Proceedings*, v. 44, sec. A, Dec. 1956, p. 367-374.

Analysis of specific heat data for diamond and of Debye's specific heat function.

7634* Generalized Theory of Interference and Its Applications. II. Partially Coherent Pencils. S. Pancharatnam. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 398-417.

An analysis of the superposition of two partially coherent but completely polarized beams.

7635* Temperature Variation of the Grüneisen Constant in Crystals. R. Srinivasan. *Indian Institute of Science, Journal*, v. 38, sec. A, Oct. 1956, p. 201-206.

Variation in the Grüneisen constant is experimentally observed in Cu, Al, V, diamond, and LiF.

7636* Ultrasonic Velocities in Some Bivalent Metallic Sulphates. C. G. Balachandran. *Indian Institute of Science, Journal*, v. 38, sec. A, Oct. 1956, p. 211-216.

From the velocities for aqueous solutions of sulfates of Mg, Co, Ni, and Cd the apparent molar compressibilities at 25, 40, and 60 C were calculated.

7637* Faraday Rotation and Residual Birefringence. V. Sivaramakrishnan and S. Ramaseshan. *Indian Institute of Science, Journal*, v. 38, sec. A, Oct. 1956, p. 228-231.

A simple method of eliminating the errors due to birefrigence.

7638* (Russian.) On the Rotation of the Polymerization of Microwaves in Paramagnetic Bodies. **O vrashchenii ploskosti poliarizatsii mikrovoln v paramagnetikakh.** L. Ia. Shekun. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 20, Nov. 1956, p. 1262-1264.

A theoretical explanation of the basic rules of the Faraday microwave effect by considering a paramagnetic for which the theory of the susceptibility applies well, and especially a paramagnetic gas.

7639 Study of Boiling in Short Narrow Channels and Its Application to Design of Magnets Cooled by Liquid H_2 and N_2. S. G. Sydoriak and T. R. Roberts. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 143-148.

Derivation of a theoretical expression for frictionless, two-phase, homogeneous flow in a vertical evaporator.

7640 Dependence of the Ferromagnetic Resonance Line Width on the Shape of the Specimen. A. D. Berk. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 190-192.

7641 Air Bubbles in Water. Leonard Liebermann. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 205-211.

Freely rising bubbles exhibit a solution rate more than twice that of bubbles which are stationary. Bubbles of dimension less than 1μ lodged on hydrophobic particles are not soluble and can exist indefinitely.

7642 Buildup of Electroluminescent Brightness. Claus H. Haake. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 245-250.

Comparison with the buildup of photoluminescence under various conditions which affect the electron population in traps.

7643 Aging Characteristics of Electroluminescent Phosphors. S. Roberts. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 262-265.

7644 Ultrasonic Double Refraction in Single Crystals. P. C. Waterman and L. J. Teutonico. *Journal of Applied Physics*, v. 28, Feb. 1957, p. 266-270.

Causes, effects, and methods of observing the phenomena with pulsed echo methods.

7645 Measuring the Ratio of Specific Heats of a Gas. Joseph A. Schufle. *Journal of Chemical Education*, v. 34, Feb. 1957, p. 78-80.

Thermodynamic experiments involving harmonic motion.

7646 On the Propagation of Weak Discontinuities in Perfectly Plastic Solids. T. Y. Thomas. *Journal of Mathematics and Mechanics*, v. 6, Jan. 1957, p. 67-85.

An investigation of the existence of singular surfaces of order 1, also referred to as wave surfaces, in the plane stress problem for perfectly plastic solids, under the assumption of the von Mises and the Prandtl-Reuss equations of plastic flow.

7647 On a Complementary Energy Principle. D. Trifan. *Journal of Mathematics and Mechanics*, v. 6, Jan. 1957, p. 87-90.

Considers a stress-strain relation for homogeneous, isotropic, incompressible, strain hardening materials exhibiting a gradual transition from the elastic to the plastic state; the so-called stress theory of plastic flow.

7648 Theory of Dielectric Relaxation for the Three-Dimensional Polar Rotator; Lattice Models Leading to Bimodal Loss Curves. John D. Hoffman and Benjamin M. Axilrod. *Journal of Research, National Bureau of Standards*, v. 58, Feb. 1957, p. 61-73.

An extremely wide set of relaxation times capable of leading to a bimodal loss curve can be predicted theoretically for systems that, for reasons of lattice symmetry and molecular shape, may reasonably be assumed to consist of three-dimensional polar rotators with five orthogonal orientations.

7649 Electron-Lattice Interactions in Polar Crystals. Theodore D. Schultz. *Massachusetts Institute of Technology, Solid-State and Molecular Theory Group, Technical Report No.* 9, Aug. 1956, 275 p. (QC1 M38.7t Vis.)

General mathematical formulation; classical theories of the polaron; self-energy and effective mass of the polaron; scattering and mobility propagation of the Feynman polaron.

7650 Optical Properties and Oxidation of Evaporated Titanium Films. Georg Hass and Alan P. Bradford. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 125-129.

Includes data on optical constants of Ti in the visible and on its reflectance in the wavelength region from 1000 A to 10μ.

7651 Phase Condition for Light Incident Normally on a Semireflecting Film. Allan R. Cownie. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 132-136.

Effect of phase condition on multiple beam reflection fringes and filters is studied theoretically.

7652 Secondary and Tertiary Interferometric Wavelength Standards in the 1.5-2.5μ Region. D. H. Rank, A. H. Guenther, J. N. Shearer, and T. A. Wiggins. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 144-148.

7653 A Method of Determining Optical Cross Sections. Einar Hinnov. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 151-155.

Method is based on the measurement of the total line intensity as a function of the density of the emitting atoms in a flame source.

7654 Optical Cross Sections From Intensity-Density Measurements. Einar Hinnov and Hedwig Kohn. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 156-162.

Optical cross sections corresponding to spectral lines of Li, Na, K, Ca, Sr, Ba, Tl, Cu, Ag, Cr, Mn, Fe, Co, and Ni emitted by an acetylene-air flame were determined.

7655 Sharp Line Absorption in Silica Near 3400 CM^{-1}. Arnold M. Bass and Herbert P. Broida. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 163-164.

Sharp absorption lines were observed at temperatures near 4 K in samples of fused silica and crystal quartz. The strongest lines are near 3365 cm^{-1} and 3472 cm^{-1} and have widths at half height of less than 2.5 cm^{-1}.

7656 Spectral Reflectance of Solids for Aluminum *K* Radiation. R. W. Hendrick. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 165-171.

The fraction of Al *K* radiation reflected from flat glass, Mg, Al, Cu, Ag, and Au surfaces was measured as a function of the angle of grazing incidence.

7657 Simple Absolute Method for Measuring Diffuse Reflectance Spectra. Kazuo Shibata. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 172-175.

Instead of the usual integrating sphere a small sheet of opal glass is used to diffuse the light beam before it falls on the sample. Reflectance of MgO was measured.

7658 Tables of the Refractive Index for Standard Air and the Rayleigh Scattering Coefficient for the Spectral Region Between 0.2 and 20.0μ and Their Application to Atmospheric Optics. Rudolf Penndorf. *Optical Society of America, Journal*, v. 47, Feb. 1957, p. 176-182.

7659 Analog Computers Calculate Heat Transfer. Robert S. Schechter. *Petroleum Refiner*, v. 36, Feb. 1957, p. 112-114.

Useful graphs show conditions for natural convection.

7660 The Optical Effects of Radiation Induced Atomic Damage in Quartz. E. W. J. Mitchell and E. G. S. Paige. *Philosophical Magazine*, v. 1, ser. 8, Dec. 1956, p. 1085-1115.

Thin specimens show that absorption in the long wavelength tail of the absorption edge was enhanced during the irradiation.

7661 The Onset of Friction in Helium II. D. F. Brewer, D. O. Edwards, and K. Mendelssohn. *Philosophical Magazine*, v. 1, ser. 8, Dec. 1956, p. 1130-1132.

7662 Angles Between Partial Magnetizations in Spinel Ferrites Containing Manganese Ions of More Than One Valency. W. P. Osmond. *Philosophical Magazine*, v. 1, ser. 8, Dec. 1956, p. 1147-1156.

7663 (English.) **On the Interpretation of the Characteristic Energy Losses of Electrons in Thin Foils.** R. H. Tredgold. *Physica*, v. 22, Dec. 1956, p. 1219-1222.

Explanation of phenomena in terms of inter-band transitions.

7664 (English.) **Accelerating Spherical Light Wave Clocks in Chronogeometry.** A. D. Fokker. *Physica*, v. 22, Dec. 1956, p. 1279-1282.

Model of an idealized instrument which is clock and yard-stick both in one.

7665 (English.) **The Effective Field and the Frequency of Overtones and Combination Bands in the Vibration Spectra of Crystals.** C. Haas and J. A. A. Ketelaar. *Physica*, v. 22, Dec. 1956, p. 1286-1290.

7666 Relation Between the Canonical and Grand Canonical Ensemble. M. B. Lewis. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 348-353.

The "conventional" pressure in a grand canonical ensemble is shown to be, in the limit of infinite systems, identical with the canonical pressure, whenever the canonical pressure exists. The average density in a grand canonical ensemble is shown to exist except at condensation.

7667 Effect of Variable Ionic Mobility on Ambipolar Diffusion. L. S. Frost. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 354-356.

Using cylindrical geometry, results for He^+ ions in He indicate that ambipolar diffusion in a low-pressure positive column may be reduced by a factor of two or more from that predicted by using constant mobility.

7668 Principle of Minimum Entropy Production. Herbert B. Callen. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 360-365.

In the steady state of an irreversible process the density matrix is such as to minimize the rate of entropy production.

7669 Townsends' First Ionization Coefficient in Nitrogen. Melvin A. Harrison. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 366-368.

Experimental measurements.

7670 Magnetostatic Modes in Ferromagnetic Resonance. L. R. Walker. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 390-399.

The mode spectrum of spheroids is examined for the case where exchange and electromagnetic propagation can be ignored simultaneously.

7671 Optical and Electrical Properties of Silver Chloride. P. G. Aline. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 406-412.

Simultaneous measurements of absorption, fluorescence, and photoconductivity were investigated for AgCl as functions of exciting radiation and temperature.

7672 Disordered One-Dimensional Crystals. Helmut Schmidt. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 425-441.

A mathematical method is developed which gives fairly generally the density of eigenstates for one-dimensional disordered systems. A disordered linear chain of elastically coupled masses, electronic energy-states in a one-dimensional disordered crystal, and impurity bands in a uniform crystal are considered.

7673 Paramagnetic Resonance Spectrum of Ammonium Chromium Alum. C. F. Davis, Jr. and M. W. P. Strandberg. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 447-455.

7674 Impurity-Induced Localized Modes of Lattice Vibration in a Diatomic Chain. Robert L. Bjork. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 456-459.

7675 Modified Deformable Potential for Thermal Scattering of Electrons. John B. Gibson and Joseph M. Keller. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 476-479.

7676 Temperature Dependence of the Piezoresistance of High-Purity Silicon and Germanium. F. J. Morin, T. H. Geballe, and C. Herring. *Physical Review*, v. 105, ser. 2, Jan. 15, 1957, p. 525-539.

7677* (English.) **Study of Simultaneous Reflection in Electron Diffraction by Crystals. I. Theoretical Treatment. II. Experimental Confirmation.** Kyozaburo Kambe. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 13-31.

7678* (English.) **Phenomenological Theory of the Molecular Absorption and Dispersion of Sound in Fluids and the Relation Between the Relaxation Time of the Internal Energy and the Relaxation Time of the Internal Specific Heat.** Otohiko Nomoto. *Physical Society of Japan, Journal*, v. 12, Jan. 1957, p. 85-99.

Formulas applicable for both liquids and gases are derived.

7679 Determination of the Magnetic Anisotropy Constant K_2 of Cubic Ferromagnetic Substances. Hiroshi Sato and B. S. Chandrasekhar. *Physics and Chemistry of Solids*, v. 1, Jan. 1957, p. 228-233.

The constant for Fe and Ni was determined by means of magnetic torque measurements.

7680 Principle for Null-Determination of Magnetization and Its Application to Cryogenic Measurements. Anthony Arrott and J. E. Goldman. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 99-102.

Method utilizes a sample in a uniform magnetic field such that the sample does not affect the uniformity of the field, and the sample itself is uniformly magnetized. Measurement is in terms of current and length.

7681 Crystal Mount and Techniques for Measuring High-Frequency-Induced Electroluminescence. George G. Harman. *Review of Scientific Instruments*, v. 28, Feb. 1957, p. 127-129.

Measurements of light emission can be made with electrical excitation frequencies ranging from d.c. to 400 Mc. and also in selected microwave bands.

7682 Studies of the Jahn-Teller Effect. I. A Survey of the Static Problem. U. Öpik and M. H. L. Pryce. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 425-447.

An investigation of distortions in systems of two kinds of symmetry: linear molecules of chemical formula BAB and octrahedral complexes.

7683 Double Resonance Measurements of Hyperfine Structures in Potassium. G. J. Ritter and G. W. Series. *Royal Society, Proceedings*, v. 238, ser. A, Jan. 29, 1957, p. 473-488.

Radio-frequency magnetic resonances were studied between the states of the atomic level $5^2P_{3/2}$.

7684 The Cubic and Other Structural Forms of Ice at Low Temperature and Pressure. M. Blackman and N. D. Lisgarten. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 93-117 + 2 plates.

Three types of diffraction patterns are found, depending on the temperature of the base: below 140 C diffuse rings, between −140 and −120 C a sharp ring pattern characteristic of the diamond-type cubic pattern, and above −100 C the normal hexagonal pattern of ice also in the form of sharp rings.

7685 On the Quantum-Statistical Ergodic and *H*-Theorems. I. E. Farquhar and P. T. Landsberg. *Royal Society, Proceedings*, v. 239, ser. A, Feb. 12, 1957, p. 134-144.

A reassessment of the validity of these theorems.

7686* Recent Developments in Multichannel Stereophonic Recording Systems. E. W. Templin. *Society of Motion Picture and Television Engineers, Journal*, v. 66, Feb. 1957, p. 53-58.

Advances in equipment performance and operating technique applicable to the 6- and 7-channel stereophonic systems associated with large-scale motion-picture presentations.

7687* The Measurement of Industrial Noise. G. L. Bonvallet. *Tappi*, v. 40, Feb. 1957, p. 48A + 13 pages.

Principles of sound; measuring equipment and techniques; calculation of loudness of broad-band noise; a typical measurement procedure.

7688 Density of Lead Sulfide, Lead Selenide, and Lead Telluride. R. F. Brebrick. *U. S. Naval Ordnance Laboratory, Navord Report* 4429, Oct. 1956, 12 p. (TL570 Un3.55n Contin.)

A buoyancy method was used for measurements.

7689* (German.) External Light-Electrical Effect in Alkali Metals. **Zum äusseren lichtelektrischen Effekt der Alkalimetalle. I.** Relation Between the Effect and Potassium Layer Dimension. Range of Emission of Photoelectrons in the Metal. **Seine Abhängigkeit von der Schichtdicke bei Kalium Reichweite der Photoelektronen im Metall.** Harry Thomas. **II.** The Spectral Distribution of the Quantum Field in the Case of Potassium. **Di spektrale Verteilung der Quantenausbeute bei Kalium.** Herbert Mayer and Harry Thomas. **III.** The Energy Distribution in Potassium and Cesium. **Die Energieverteilung bei Kalium und Caesium.** S. Methfessel. *Zeitschrift für Physik*, v. 147, no. 4, 1957, p. 395-464.

See also: **6527** (thermal conductivity prediction); **7473** (phase transformations).

PLASTICS

7690 Epoxidation of Polyesters of Tetrahydrophthalic Acid and Unsaturated Alkyd Resins. John W. Pearce and John Kawa. *American Oil Chemists' Society, Journal*, v. 34, Feb. 1957, p. 57-61.

7691* New Products and New Applications in the Magnetic-Tape and Film Fields. Ernest W. Franck and Edward Schmidt. *Audio Engineering Society, Journal*, v. 4, July 1956, p. 90-100.

Physical and electrical characteristics of current standard tapes and Mylar tapes of various gages. "Print-through" characteristics of materials coated on base supports as thin as 0.5-mil Mylar. Use of striped magnetic film in motion pictures and television.

7692* (German.) Viscosimetry of Polyamides. **Zur viskosimetrie der polyamide.** F. Rybnikář. *Collection of Czechoslovak Chemical Communications*, v. 21, Oct. 1956, p. 1101-1107.

Study of polyamide fractionation.

7693* (German.) Non-Newtonian Flow of Dilute Solutions of Polymethylmethacrylates. **Nichtnewotonsche Strömung Verdünnter Lösungen von Polymethylmethakrylaten.** M. Bohdanecký and J. Exner. *Collection of Czechoslovak Chemical Communications*, v. 21, Dec. 1956, p. 1584-1591.

7694* (Russian.) Kinetics of Phenol-Formaldehyde Resin Solidification Using Hexamethylene-Tetramine. **K voprosu o kinetike otverzhdeniia fenol'no-formal'degidnykh smol s pomoshch'iv geksametilentetramina.** L. A. Igonin, E. G. Gintsberg, N. A. Krasulina, and V. A. Kargin. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1252-1254.

Results of thermomechanical studies in the presence of a series of additives which can act as donors of free radicals.

7695* (French.) Mechanical Relaxation of Plastic Materials. **Sur la relaxation mecanique des matières plastiques.** Arno K. Schulz. *Journal de Chimie Physique*, v. 53, Nov.-Dec. 1956, p. 933-938.

A study of the torsion modulus of three plastic substances by means of free torsion vibrations between 0.1 and 1 c.p.s. and −170 to 315 C. Dispersion phenomena are explained in relation to temperature and structure.

7696 γ-Irradiation of Polymethyl Methacrylate and Polystyrene. L. A. Wall and D. W. Brown. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 129-136.

The number of scissions produced in polymethyl methacrylate for a given dose of γ-irradiation is decreased measurably by the presence of air, small amounts of benzene, and by lowering the temperature to −196 C. Irradiation in air produced labile structures in the polymer, probably peroxides, which decompose and cause further scissions. The cross-linking reaction in polystyrene caused by γ-irradiation is also decreased when temperatures are lowered to −196 C.

7697 Melting Behavior of Irradiated Polyethylene. Malcolm Dole and W. H. Howard. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 137-139.

The specific heat of a sample of polyethylene exposed to 50 megarep of γ-radiation as well as one exposed to approximately 336 megarep of pile radiation was measured from −20 to 140 C.

7698 Interpolymer Ion-Selective Membranes. I. Preparation and Characterization of Polystyrenesulfonic Acid-Dynel Membranes. Harry P. Gregor, Harold Jacobson, Robert C. Shair, and David M. Wetstone. **II. Preparation and Characterization of Polycarboxylic Acid-Dynel Membranes.** Harry P. Gregor and David M. Wetstone. **III. Preparation and Characterization of Quaternary Ammonium-Dynel Anion-Selective Membranes.** David M. Wetstone and Harry P. Gregor. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 141-154.

7699 Some Properties of Diffusion Coefficients in Polymers. R. M. Barrer. *Journal of Physical Chemistry*, v. 61, Feb. 1957, p. 178-189.

Measurement of diffusion coefficients; a classification of penetrant-polymer systems; factors influencing the concentration dependence of diffusion coefficients; relations between viscous resistance and diffusion; selectivity in the transmission of molecules through organic membranes.

7700* (Russian.) Catalytic Rearrangement of Polyethylsiloxanic Liquids in the Presence of Aluminosilicates. **O kataliticheskoi peregruppirovke polietilsiloksanovykh zhidkostei v prisutstvii aliumosilikata.** K. A. Andrianov and T. A. Krasovskaia. *Khimicheskaia Promyshlennost'*, no. 8, Dec. 1956, p. 14-17.

In compounds with molecules having an internal tension a chain reaction takes place; in the rearrangement of compounds not having such tension, the reaction is progressive by addition and formation of an intermediate complex.

7701 Selecting Plastics Laminates for Industrial Use. Malcolm W. Riley. *Materials & Methods*, v. 45, Feb. 1957, p. 121-140.

A manual for selection of the proper grade of plastics laminate to meet specific mechanical, electrical, or chemical requirements.

7702 Molded Expanded Polystyrene. Richard Kuhlman. *Modern Packaging*, v. 30, Feb. 1957, p. 121-123.

Application to delicate electron tubes suggests a new form of package for industrial products requiring positive protection from shock and tarnish.

7703 Radiotracer Studies of PVA. II. D. G. Lundgren, J. H. Peterson, and E. P. Czerwin. *Modern Packaging*, v. 30, Feb. 1957, p. 124-125, 174, 177.

Investigation of polyvinyl alcohol as a component of milk-carton adhesives indicates that water extracts less than the zero extraction standard.

7704 Injection Moulding Without Re-Work. L. Griffiths. *Plastics*, v. 22, Feb. 1957, p. 58-60.

Reviews techniques which dispense with sprues and runners, followed by details of an experimental hot-runner mold.

7705 Extruded Film for Packaging. A. Walker. *Rubber and Plastics Age*, v. 38, Feb. 1957, p. 138-144.

Manufacture and properties of various films.

7706* (Norwegian.) Importance of the New Thermoplastic Materials for the Electrical Industry. **De nyere termoplastiske materialers betydning for den elektrotekniske industri.** Sverre Strand. *Teknisk Ukeblad*, v. 104, Jan. 10, 1957, p. 21-26.

Applications of cellulose acetate, polystyrene, polyethylene, PVC, nylon, teflon, and fluon.

7707* How to Repair and Modify Plastic Tools. Benjamin Sokol. *Tool Engineer*, v. 38, Mar. 1957, p. 86-90.

Armed with the excellent plastic tooling resins available today, quick, inexpensive, and successful tool repair or modification is usually entirely feasible.

7708 Speed Variator Drives for Extruders and Wire Insulating Extruder Lines. R. K. Larson. *Wire and Wire Products*, v. 32, Feb. 1957, p. 161-166, 214-215.

Drives that, used with improved extruder temperature controls, non-contact diameter measuring equipment and automatic take-up reel stands, should insure better extruded coatings and lower costs.

7709* (Croatian.) Corrosion Resistant Plastic Pipe. **Upotreba cijevi od plastičnih masa u industriji.** Bauman Egon. *Zastita Materijala*, v. 5, Jan. 1957, p. 12-15.

Industrial advantages include longer life, equal cost, lower maintenance, ease of producing diameters and wall thicknesses of all sizes, and ease of bending and jointing.

7710* (German.) Diffuse Melting of High Polymers Under High Pressures. **Über das unscharfe Schmelzen der Hochpolymeren unter hohen Drucken.** Ernst Jenckel and Heinz Rinkens. *Zeitschrift für Elektrochemie*, v. 60, nos. 9-10, 1956, p. 970-978.

Measurements taken during fusion at pressures up to 1800 kg. per sq. cm. showed an increase in the fusion interval. Polymers with a constantly decreasing mol. wt. were examined and two-phase fusion studied.

7711* (Russian.) The Dynamic Mechanical Properties of Polyethylene and Polytetrafluorethylene. **O dinomicheskikh mekhanicheskikh svoistvakh polietilena i politetraftoretilena.** S. P. Kabin. *Zhurnal Tekhnicheskoi Fiziki*, v. 26, 1956, p. 2628-2632.

Investigation of polymers having different degrees of crystallinity at various temperatures and frequencies.

See also: **6538** (polymerization of hydrocarbons); **6613** (chromatography of plastics); **6714** (organotin stabilizers); **7378** (plastics in patternmaking); **7518** (testing plastics); **7553** (irradiation of PVC); **7708** (extruder control for wire coatings); **7801** (epoxy resins for crease-proofing cotton); **7803** (urea and melamine resins); **7818** (epoxy adhesives).

POLLUTION AND WASTES

7712 The Effect of Light on Air Pollution. A. J. Haagen-Smit. *Air Pollution Foundation, Report No.* 15, v. 2, Nov. 1956, p. 1-25. (TD884 Ai71.3r Vis.)

Ozone is formed during the photochemical reaction of organic compounds and NO_2 in low concentrations and may be measured by physical methods, such as the cracking of rubber strips.

7713 Experimental Studies of Los Angeles Air and Kinetics of Atmospheric Reactions. R. D. Cadle. *Air Pollution Foundation, Report No.* 15, v. 2, Nov. 1956, p. 27-62. (TD884 Ai71.3r Vis.)

Summary of research on dark reactions that may occur in Los Angeles smog, reactions involving smog itself, and photochemical reactions using highly purified Los Angeles air and relatively simple systems of contaminants.

7714 Rates of Photochemical Primary Processes in Urban Air. P. A. Leighton and W. A. Perkins. *Air Pollution Foundation, Report No.* 15, v. 2, Nov. 1956, p. 113-135. (TD884 Ai71.3r Vis.)

Relation of the rates of photochemical primary processes to the diurnal variation of oxidant concentration.

7715 Analysis of Air Near Heavy Traffic Arteries. N. A. Renzetti. *Air Pollution Foundation, Report No.* 16, v. 2, Dec. 1956, 28 p. (TD884 Ai71.3r Vis.)

Samples taken near ground level contained 4 to 93 p.p.m. CO, 0.25 to 2.3 p.p.m. hydrocarbons, and 0.05 to 0.14% CO_2, as shown by infra-red spectrometry.

7716* The Use of Large Scale Parameters in Small Scale Diffusion Studies. William G. Tank. *American Meteorological Society, Bulletin,* v. 38, Jan. 1957, p. 6-12.

A method whereby gaseous diffusion in the low levels of the atmosphere can be calculated by Roberts' diffusion equation, using only large scale synoptic parameters that are readily obtainable from surface analysis and pibal reports.

7717 Determination of Ozone and Other Oxidants in Air. Coe W. Wadelin. *Analytical Chemistry,* v. 29, Mar. 1957, p. 441-442.

Ozone was absorbed in a KI solution containing a measured excess of sodium thiosulfate, which was back-titrated with 0.0IN-KIO_3 to an amperometric end point.

7718* Electro-Precipitators in the Chemical Industry—Their Applications, Cost and Operation. R. F. Heinrich and J. R. Anderson. *British Chemical Engineering,* v. 2, Feb. 1957, p. 75-78.

7719 Organizing for Effective Air Pollution Control. Edward R. Weidlein. *Franklin Institute, Journal,* v. 263, Feb. 1957, p. 97-106.

The city of Pittsburgh is used as an example to show what can be accomplished by a united community.

7720* Aeration Systems for Biological Waste Treatment. W. Wesley Eckenfelder, Jr. *Industrial Wastes,* v. 2, Jan.-Feb. 1957, p. 9-14.

Design considerations are delineated. Work remains in establishing absorption numbers for aeration equipment under various operating conditions.

7721* Toxicity Considerations in Pollution Control. Jack T. Garrett. *Industrial Wastes,* v. 2, Jan.-Feb. 1957, p. 17-19.

Waste material problems connected with manufacture of a new product.

7722* Some Answers to the Meteorological Aspects of Air Pollution. K. H. Jehn. *Industrial Wastes,* v. 2, Jan.-Feb. 1957, p. 20-23.

Ways to correct an air polution problem are: eliminate its production, collect the waste at its source, or obtain better atmospheric dispersion.

7723 Atmospheric Pollution—Relationship Among Exposure Periods, Foliar Burn, and Fluorine Content of Plants Exposed to Hydrogen Fluoride. D. F. Adams, J. W. Hendrix, and H. G. Applegate. *Journal of Agricultural and Food Chemistry,* v. 5, Feb. 1957, p. 108-116.

The 40 plant varieties fumigated averaged 91.3% as responsive to HF in darkness as in daylight. They were somewhat more responsive to a daily low fumigation concentration than to twice weekly higher concentrations of approximately equivalent exposure factor.

7724 A High-Speed Computer for Predicting Radioactive Fallout. J. H. Wright, L. Taback, and H. K. Skramstad. *Journal of Research, National Bureau of Standards,* v. 58, Feb. 1957, p. 101-109.

Computer predicts geographic pattern of radioactive fallout. Input data consist of wind magnitudes and directions as functions of initial height in the cloud, and the distribution of radioactivity in the cloud as a function of particle size and initial height of the cloud.

7725 Determination of Radioactive Fall-Out. J. J. Fitzgerald. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission),* KAPL-1439, Feb. 1956, 25 p. (UF767 Un3.1ka Contin.)

Origin, quality, and quantity of radioactivity in the atmosphere; processes of deposition; integrated external dose from rain-out.

7726 Separation of Nitrate and Aluminum From Radioactive Chemical Wastes. John B. Huff. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission),* IDO-14392, Jan. 1957, 15 p. (UF767 Un3.1id Contin.)

Nitrates are removed by reduction to NO_2 with C. Excess C absorbs the residues to form a porous sinter which is chlorinated at elevated temperatures to expel Al as the volatile chloride. Burning the C residue yields an ash of crude fission product compounds.

7727* Investigation of Primary Lagoon Treatment at Mojave, California. Robert C. Merz, John C. Merrell, and Ralph Stone. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 115-123.

The sewage treatment appeared quite effective. Further evaluation of operating data is needed to provide criteria for the dsign of such units.

7728 Enlarged Sewage Disposal Facilities for Los Angeles. Robert J. Theroux. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 124-133.

Details of plans for increased water reclamation and ocean disposal of sewage.

7729* Preliminary Report on Recommended Units of Expression for Design and Operation of Sewage and Industrial Wastes Treatment Plants. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 134-142.

7730* Sources and Control of Radioactive Water Pollutants. E. C. Tsivoglou and W. W. Towne. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 143-156.

Deals with stream monitoring, standards, and safe practices.

7731* Trickling Filter Studies in Treating Pulp and Paper Mill Wastes. James E. Lebo and John W. Hassler. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 170-182.

Laboratory and pilot plant studies. Data relative to the mill processes, waste characteristics, present treatment facilities, and other pertinent information.

7732* Organization and Accomplishments of the California Water Pollution Control System. A. M. Rawn and Vinton W. Bacon. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 201-209.

7733* Activity of Cellulose-Decomposing Fungi Isolated From Sewage-Polluted Water. Wm. Bridge Cooke and Kenneth A. Busch. *Sewage and Industrial Wastes,* v. 29, Feb. 1957, p. 210-217.

Inocula of fungus mycelia are less effective in aiding the reduction of cellulose than inocula of spore suspensions when the growth medium is raw sewage. For the other media, spore suspension inocula are somewhat less effective.

7734 Ideas for Waste Treatment. *Steel,* v. 140, Feb. 18, 1957, p. 150-154.

7735* Sewage and Industrial Wastes in 1956. Emil C. Jensen. *Water & Sewage Works,* v. 104, Feb. 1957, p. 49-61.
A review of problems, developments, and trends of the year.

See also: **6354** (effects of air pollution on plants); **6528** (dust collectors); **6564** (determination of Hg in air); **6723** (reactions of air pollutants); **6724** (smog-forming reactions); **6933** (treatment of plating wastes); **7827** (ozone toxicity).

RUBBER AND ELASTOMERS

7736 Applications of Infrared Spectroscopy. Some Applications of Infrared Spectroscopy to Structural Problems in the Rubber Industry. W. H. T. Davison. *Chemistry & Industry,* no. 5, Feb. 2, 1957, p. 131-135.

Olefinic correlations; structure of elastomeric polydienes; structure, reactions, crystallinity, and configuration of elastomers.

7737* (Russian.) The Mechanism of Adhesion and Autoadhesion in Rubbers. **O mekhanizme adgezii i avtogezii kauchukov.** B. V. Deriagin, S. K. Zherebkov, and A. M. Medvedeva. *Doklady Akademii Nauk SSSR*, v. 111, Dec. 21, 1956, p. 1267-1270.

An attempt to evaluate the relative significance of molecular-chain and relaxation-mechanical aspects.

7738* (English.) **Dynamic Tests on the Stability of Bituminous Mixtures for Pavement at Low Temperature. III. Experimental Researches on Reclaimed and Natural Rubber Blended Asphalt and Asphalt Mixtures.** Chuzo Itakura and Teruo Sugawara. *Hokkaido University, Faculty of Engineering, Memoirs*, v. 10, Sept. 1956, p. 179-209.

Rubber additions increased impact resistance, softening point, ductility at low temperature, and viscosity.

7739* (Russian.) Oil-Extended Rubbers and Their Technical Properties. Production of Stable Oil Emulsions and Determination of the Conditions in Which They Mix With Latex. **Maslianye kauchuki i ikh tekhnicheskie svoistva. Poluchenie ustoichivykh emul'sii masel i opredelenie uslovii ikh smesheniia lateksom.** A. E. Kalaus, M. A. Rabinerzon, P. I. Zakharchenko, A. B. Zaitseva, and M. S. Fainshtein. *Khimicheskaia Promyshlennost'*, no. 8, Dec. 1956, p. 1-7.

7740* (Russian.) Oxidation of Rubbers and Action of Antioxidants. **Okislenie rezin i deistvie protivostaritelei.** A. S. Kuzminskii and L. G. Angert. *Khimicheskaia Promyshlennost'*, no. 8, Dec. 1956, p. 8-14.

Kinetics of oxidation of a series of typical rubbers with and without antioxidants.

7741* (German.) Rubber Based Foam Products. Manufacturing, Testing, and Using Cellular Rubber. **Schaumstoffe auf Kautschukbasis. Herstellung, Prüfung und Verwendung von Gummi mit zelliger Struktur.** G. Saffran. *Plaste und Kautschuk*, v. 3, Dec. 1956, p. 294-296.

7742 The Compounding of Transparent Rubber. I. Natural Rubber. Ralph F. Wolf. *Rubber Age*, v. 80, Feb. 1957, p. 823-833.

Formulations and test results.

7743 The Chemistry of Reinforcement. II. Scorch in Natural Rubber Stocks Containing Carbon Black. Merton L. Studebaker and Lester G. Nabors. *Rubber Age*, v. 80, Feb. 1957, p. 837-842.

Shows that H_2S formation is catalyzed by carbon black.

7744 Equipment for High-Temperature Testing. Thomas F. Lavery, Frank S. Grover, Sydney Smith, and Leland J. Kitchen. *Rubber Age*, v. 80, Feb. 1957, p. 843-849.

Apparatus is an oven, built around an L-6 Scott tester, that can be operated to 650 F and can be modified to operate as high as 1000 F.

7745 Conductive Rubber. Its Production, Application and Test Methods. R. H. Norman. *Rubber Journal*, v. 132, Jan. 26, 1957, p. 108 + 3 pages; Feb. 9, 1957, p. 172 + 4 pages.

Factors determining effects of mixing and vulcanization conditions on resistivity. (To be continued.)

7746* Resistance of Rubber Compounds to Outdoor and Accelerated Ozone Attack. C. V. Lundberg, G. N. Vacca, and B. S. Biggs. *Rubber World*, v. 135, Feb. 1957, p. 699-713.

The relative effectiveness of waxes, antiozonants, higher than normal concentrations of antioxidants, and combinations of such protective agents in natural, nitrile, styrene-butadiene, and butyl rubber was determined.

7747* The Determination of Oil and Stabilizer in Oil-Masterbatched Polymers. Dorothy C. Prem, T. B. Larchar, Sr., N. S. Trommer, and R. M. Clibourn. *Rubber World*, v. 135, Feb. 1957, p. 714-720, 722.

Results of using an ultra-violet spectrophotometric technique.

7748 New Developments in Silicone Rubber Compounds for Extruded Electrical Insulation. Maynard G. Noble. *Wire and Wire Products*, v. 32, Feb. 1957, p. 170 + 6 pages.

Major applications, technological developments, and physical and electrical properties.

See also: **7282** (fabrication of rubber).

SPACE HEATING AND CONDITIONING

7749* Practical Pointers for Selecting the Right Motor for Every Job. Edward Dowis. *Commercial Refrigeration & Air Conditioning*, v. 14, Feb. 1957, p. 94-97, 120.

Basic types of motors and their common uses in the air conditioning systems.

7750 Electric Heating in the Home. S. L. Forsyth. *Electrical Engineering*, v. 76, Feb. 1957, p. 118-123.

Comparative analysis of the various types of electric heating.

7751* Air Refrigeration. IV. Current Ventilation Practice for Hot Deep Mines. J. M. Caw. *Mine & Quarry Engineering*, v. 23, Feb. 1957, p. 69-73.

Factors affecting the temperature in working places; selection of a cooling method for the ventilating air. (To be continued.)

7752* Condensation in Pulp and Paper Mill Roofs. M. F. Smith. *Pulp and Paper Magazine of Canada*, v. 58, Feb. 1957, p. 79-82.

Concludes from a survey of 21 plants that the best protection for the roof and the deck is a combination of insulation, vapor barrier, hooding, and fresh make-up air.

7753* How New Refrigeration System Reduces Electrical Demand in AC Equipment. William L. McGrath. *Refrigerating Engineering*, v. 65, Feb. 1957, p. 52 + 11 pages.

7754* Vapor Seal, Dehumidification—or Both? Cary B. Gamble. *Refrigerating Engineering*, v. 65, Feb. 1957, p. 58-60.

In cold storage plants a lower attic temperature reduces normal refrigeration load operation cost of system.

7755 Special Study of Domestic Heating in the United Kingdom—Present and Future. v. II. Proceedings of the Conference, 1956. 104 p. Institute of Fuel, London. (TH7222 In8s Over.)

Papers and discussions dealing with distribution and storage of solid fuel, design of dwellings, town planning aspects of smokeless zones, heating methods, appliances, fuels, and planning and administration of smoke control areas.

7756 Investigation of the Performance of Automatic Storage-Type Gas and Electric Domestic Water Heaters. Eugene F. Hebrank. *University of Illinois, Engineering Experiment Station Bulletin No.* 436, Oct. 1956, 39 p. (T1 16b Vis.)

Data obtained under actual operating conditions.

See also: **7128** (gas water heaters).

TEXTILES, FIBERS, LEATHER, AND PAPER

7757* (English.) **The Chemistry of the Natural Order Cupressales. XVII. Heartwood Constituents of *Pilgerodendron uviferum* (D.Don) Florin (=*Libocedrus tetragona* Ends).** H. Erdtman, Z. Pelchowicz, and J. G. Topliss. *Acta Chemica Scandinavica*, v. 10, no. 10, 1956, p. 1563-1567.

7758* The Sulfur Dyes. John L. Crist and R. E. Rupp. *American Dyestuff Reporter*, v. 46, Feb. 11, 1957, p. 83P-86P.

Virtues and limitations; recent developments in application techniques.

7759* The Interaction of Cellulose With Simple Salt Solutions and With Dyebaths. Mary Moncrieff-Yeates and Howard J. White, Jr. *American Dyestuff Reporter*, v. 46, Feb. 11, 1957, p. 87P-96P.

Radioactive tracer techniques were used to study the absorption of various ions by cellulose. Measurements were made on the absorption of Na and SO_4 ions from Na_2SO_4 solutions at 25 and 90 C and from Na_2SO_4 solutions containing a direct dye at 90 C.

7760* Wear Tests With the Accelerator. A. R. Macormac and F. M. Richardson. *American Dyestuff Reporter*, v. 46, Feb. 25, 1957, p. 149-151.

Percentage of worn wool ends consistently increased with increased time in the Accelerator, indicating a good method for measuring the abrasive damage to wool fabrics in this machine.

7761* The Internal Application of Color in the Manufacture of Man-Made Fibers. Emmanuel I. Birnbaum, C. Eugene Coke, J. Dean, Leon E. Moody, Louis J. Sheps, and B. F. Vowles. *American Dyestuff Reporter*, v. 46, Feb. 25, 1957, p. 125P-130P.

Invention, development, and commercial growth of a number of the more important man-made fibers. Methods for incorporation of pigments into the spinning dope. Color-fastness characteristics of spun-dyed fibers.

7762* A Study of Mixed-Spore Culture and Soil-Burial Procedures in Determining Mildew Resistance of Vinyl-Coated Fabrics. A. David Baskin and Arthur M. Kaplan. *Applied Microbiology*, v. 4, Nov. 1956, p. 288-293.

Soil burial for 14 days, followed by the Clark flexibility measure, afforded best reproducibility for measure of degradation.

7763* Effect of Shape on Efficiency of Boxes. C. A. Jordan. *Fibre Containers and Paperboard Mills*, v. 42, Feb. 1957, p. 46-48, 51.

The curves given should permit selection of the most economical shapes of shipping containers consistent with limitations on shape imposed by the load itself, economical cutting of box parts or blanks from available lumber or fiberboard stock, or other factors, such as pallet dimensions or dimensions of storage and shipping space.

7764* Heat Transmission Properties of Fabrics. I. D. L. Aelion. *Fibres, Engineering and Chemistry*, v. 18, Feb. 1957, p. 51-53.

Theoretical background associated with thermal comfort and porosity. Description of fabric samples studied.

7765* Some Economic Characteristics of the Pacific Coast Softwood Plywood Industry. Thomas A. Petit. *Journal of Forestry*, v. 55, Feb. 1957, p. 124-129.

7766* Direct Cotton Dyes. I. Chromatographic Purification and Crystallization of Congo Red, Benzopurpurine 4B and Chrysophenine G. T. S. Gore, M. K. Unni, and K. Venkataraman. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Nov. 1956, p. 618-626.

7767* Studies on the Optical Diffraction Patterns of Twisted Fibres. P. K. Katti and M. T. Chiplonkar. *Journal of Scientific & Industrial Research*, v. 15, sec. B, Dec. 1956, p. 673-676.

Procedure offers an accurate means of determining extent of twist.

7768* Eastman's New 50 Yarn. J. M. Heape and R. H. Norrell. *Modern Textiles Magazine*, v. 38, Feb. 1957, p. 33-34, 81.

Functional properties and processing characteristics of new acetate yarn.

7769* Mill Test Procedures. VIII. Yarn Preparation Tests for Better Weaving. Norbert L. Enrick. *Modern Textiles Magazine*, v. 38, Feb. 1957, p. 39-40, 73-74.

Procedures for purchased yarn quality test, filament yarn dye index test, winder tension check, twist setting test, ply twist determination, and quilling frame check. (To be continued.)

7770* Ornamentation of Apparel Fabrics. Spot Designs. Victor Lobl. *Modern Textiles Magazine*, v. 38, Feb. 1957, p. 48 + 4 pages.

Ways of modifying or augmenting the different pattern arrangements to provide a more varied appearance of the cloth. (To be continued.)

7771* Textile Gains in 1956. J. B. Goldberg. *Modern Textiles Magazine*, v. 38, Feb. 1957, p. 63-71.

A summary of world-wide developments in every area of the textile industry.

7772 Research Projects in the Pulp and Paper Industry, 1955-1956. Committee on Coordination of Research, Annual Report No. 14. 81 p. American Paper and Pulp Assn., New York. (Pamphlet)

Research projects are listed according to sponsoring institution.

7773 Review of Textile Progress. v. VII. 581 p. 1955. The Textile Institute and the Society of Dyers and Colourists, Manchester, England. (TS1449 R32 Vis.)

Review articles covering the physics and chemistry of fibrous materials; fiber, yarn and fabric production; printing, dyeing, and finishing fabrics; testing; laundering; building and engineering aspects and industrial application of textiles.

7774* Equilibrium Adsorption Values of Leuco Vat Dyes on Cotton. R. H. Peters and H. H. Sumner. *Society of Dyers and Colourists, Journal*, v. 73, Jan. 1957, p. 12-16.

Adsorption values were measured in various concentrations of NaCl and NaOH, and thermodynamic affinities calculated. Affinities show a regular drift as the concentration of electrolyte is changed.

7775* Some Observations on the Absorption of Alkali by Wool Keratin From Aqueous Solutions of Sodium Carbonate and Bicarbonate. R. P. Harker. *Society of Dyers and Colourists, Journal*, v. 73, PJan. 1957, p. 17-23.

Effects of concentration of alkaline salt, time of immersion, liquor ratio, and temperature of equilibration were studied in relation to subsequent measurement of the pH of an aqueous extract of a treated sample.

7776* Study of the Affinity of Black Wattle Extract Constituents. IV. Relative Affinity of Polyphenols for Swollen Chemically Modified Collagen. R. L. Sykes and D. G. Roux. *Society of Leather Trades' Chemists, Journal*, v. 41, Jan. 1957, p. 14-22 + 3 plates.

Over-all affinities of tanning constituents for different substrates increased in the order: esterified collagen, collagen, deaminised collagen, carboxymethylated collagen, and acetylated collagen.

7777* Brown-Stock Washing of Softwood Kraft. Thomas B. Calhoun, Malcolm B. Pineo, and David Wetherhorn. *Southern Pulp and Paper Manufacturer*, v. 20, Feb. 1957, p. 52, 54.

Operating data from two mills producing widely dissimilar pulps from similar woods.

7778* Analysis of a Pulp Washing System. Bruce Armstrong. *Southern Pulp and Paper Manufacturer*, v. 20, Feb. 1957, p. 56, 58, 61-62.

A mathematical analysis based on the "displacement ratio" concept.

7779* (English.) **Carboxyl and Carbonyl Groups in Cellulose Degraded by Aging of Alkali Cellulose.** Folke Alvång and Olof Samuelson. *Svensk Papperstidning*, v. 60, Jan. 31, 1957, p. 31-36.

The carbonyl content, was found to be higher in cellulose degraded with H_2O_2 in the steeping liquor than in cellulose degraded by aging in air.

7780* (English.) **The Utilization of Bark. I. Index to Bark Literature.** J. E. Marian and A. Wissing. *Svensk Papperstidning*, v. 60, Jan. 31, 1957, p. 45-49.

Contains about 150 entries.

7781* The Bleaching of Eastern Spruce Groundwood With Alkaline Peroxide. I. Reaction Kinetics. II. Brightness and Color Change. Darrell M. Martin. *Tappi*, v. 40, Feb. 1957, p. 65-75.

Reaction rate and amount of brightness improvement increase with pH.

7782* Paper Conditioning. J. D. Lynch. *Tappi*, v. 40, Feb. 1957, p. 76-79.

Reasons for conditioning paper in the mill; paper finishing; operation of cycle conditioner.

7783* A Method for Preparing Chain Length Distribution Curves. Application to a Series of Pulps. A. M. Dowell, Jr. *Tappi*, v. 40, Feb. 1957, p. 79-83.

7784* Statistical Analysis of Some Factors Influencing the Physical Testing of Pulp. I. The Influence of Time and Basis Weight Variations. Thomas W. Bauer. *Tappi*, v. 40, Feb. 1957, p. 84-91.

7785* Viscosity Control of Paper Coating Adhesives With Urea. J. R. Belche, Jr. and G. C. Ellis. *Tappi*, v. 40, Feb. 1957, p. 94-99.

Urea lowers the thixotropic index and initial viscosity of dispersions of modified starches, casein, and a proteins, and decreases the rate of viscosity increase with age. It has no effect on unmodified starches other than to lower gelation temperature.

7786* Colorimetric Method as a Means of Studying Carbohydrate Sorption on Pulps. James L. Keen and Joseph W. Opie. *Tappi*, v. 40, Feb. 1957, p. 100-104.

Effects of freeness, pulp concentration, time, and pH on sorption of galactomannan guar by boxboard and bleached kraft pulp.

7787* Effect of Latex Variables on Properties of Coating Colors and Coated Papers. D. A. Taber and R. C. Stein. *Tappi*, v. 40, Feb. 1957, p. 107-117.

7788* A Preliminary Investigation of Paper-Laminate Property Relationships. G. R. Shaw. *Tappi*, v. 40, Feb. 1957, p. 118-119.

With certain resin conditions, inherent paper properties are virtually nullified and cheaper paper grades may be used with no sacrifice in quality.

7789 The Relation Between Coefficient of Friction, Conductivity and Static Electrification Induced by Friction in Cellulose Acetate Yarns. G. Quintelier, M. Warzée, and R. Sioncke. *Textile Institute, Journal (Proceedings)*, v. 48, Jan. 1957, p. P26-P39.

In order to avoid static troubles in processing, it is desirable that yarns have low coefficients of friction, but even more desirable that they have the largest possible conductivity.

7790 The Relation Between Structure, Dielectric Constant, and Electrical Resistance of Fibres. J. W. S. Hearle. *Textile Institute, Journal (Proceedings)*, v. 48, Jan. 1957, p. P40-P54.

7791 The Reduction of Static Electrification by Incorporating Viscose Rayon Containing Carbon. J. Boyd and D. Bulgin. *Textile Institute, Journal (Proceedings)*, v. 48, Jan. 1957, p. P66-P99.

Preparation and behavior of fabrics composed partly of viscose rayon yarns incorporating carbon black and therefore being of a conducting rather than insulating character.

7792 Anti-Static Agents as Applied to Wool. J. A. Medley. *Textile Institute, Journal (Proceedings)*, v. 48, Jan. 1957, p. P112-P122.

The relative freedom of wool from trouble in processing due to electrification is discussed in relation to several factors such as the rough scaly surface, the power to sorb and retain electrolytes, and the effect of oils in developing the conducting films.

7793 Moisture Relations of Cellulose. III. Sorption Hysteresis and the Effect of Temperature. M. Wahba and S. Nashed. *Textile Institute, Journal (Transactions)*, v. 48, Jan. 1957, p. T1-T19.

Results support Urquhart's theory of hysteresis that the sorbing surface is in a more active state on desorption than on adsorption. A consideration of the free energy of adsorption, as applied to the chain molecular structure of cellulose, indicates that hysteresis is increased at lower humidities above the optimum temperature.

7794 The Subjective Assessment of the Roughness of Fabrics. H. C. W. Stockbridge, K. W. L. Kenchington, K. G. Corkindale, and J. Greenland. *Textile Institute, Journal (Transactions)*, v. 48, Jan. 1957, p. T26-T34.

7795* Some Effects of Nuclear Irradiations on Cotton Yarn. Edward S. Gilfillan and Leo Linden. *Textile Research Journal*, v. 27, Feb. 1957, p. 87-92.

The presence of water vapor and atmospheric O during irradiation has little or no effect on the strength. Degradation products were formed, principally oxycellulose of the acidic type. Irradiated cotton has lower affinity than normal for direct dyes, and greater affinity than normal for basic dyes.

7796* Chemical Modification of Cotton by Reaction With Activated Olefinic Compounds. Jane W. Frick, Wilson A. Reeves, and John D. Guthrie. *Textile Research Journal*, v. 27, Feb. 1957, p. 92-99.

Compounds having olefinic linkages in conjugation with strongly electronegative groups vary widely in the ease with which they etherify cellulose in a base-catalyzed addition reaction.

7797* The Detection of Fungal Growth in Cellulosic Textiles. G. R. F. Rose, M. Mitton, B. J. Gardner, D. M. Laird, and C. H. Bayley. *Textile Research Journal*, v. 27, Feb. 1957, p. 99-110.

Staining test is a modification of the Pianese IIIb test and depends on a simple differentiation in color between fungal hyphae and substrate.

7798* A New Cotton Lustermeter for Yarns and Fibers. Dorothy Nickerson. *Textile Research Journal*, v. 27, Feb. 1957, p. 111-123.

Single-answer, direct-reading instrument is especially adapted for measuring luster of raw cotton and gray and mercerized yarns. Luster, sample preparation and holder, the instrument, calibration, and luster results are summarized.

7799* Strength Tests of Fiber Arrays. D. H. Patt and C. R. Stock. *Textile Research Journal*, v. 27, Feb. 1957, p. 124-128.

Strength, maximum strain, and associated measures of variability can be calculated from energy via the tenacity-strain function for the fiber type.

7800* A Simplified Relationship Between the Properties of Resin-Finished Cotton Fabric and the Solids Applied. S. H. Foster. *Textile Research Journal*, v. 27, Feb. 1957, p. 129-135.

Wrinkle recovery, tensile strength, and tear strength vary linearly as the logarithm of the resin solids deposited up to a point beyond which additional resin does more harm than good.

7801* Epoxy Resins in the Crease Proofing of Cotton. C. W. Schroeder and F. E. Condo. *Textile Research Journal*, v. 27, Feb. 1957, p. 135-145.

Epoxy resins give a very durable finish and treated fabrics retain substantially all of their crease resistance for the life of the garment.

7802* The Mechanism of Crease Resistance Development on Cellulosic Fabrics Treated With Dimethylol Ethylene Urea. H. C. Walter, J. K. Buxbaum, and L. Q. Green. *Textile Research Journal*, v. 27, Feb. 1957, p. 146-149.

7803* Comparison of Wrinkle-Resistant Finishes for Cotton. T. F. Cooke, P. B. Roth, J. M. Salsbury, G. Switlyk, and W. J. van Loo. *Textile Research Journal*, v. 27, Feb. 1957, p. 150-165.

Chemistry of urea- and melamine-type resins. Effect of variations in resin concentration, curing temperature, and time on the wrinkle recovery, tensile- and tear-strengths, and discoloration of the treated fabric before and after washing.

7804 Effect of 5,000 Cycles of Repeated Bending Stresses on 5-Ply Sitka Spruce Plywood. W. J. Kommers. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1305, Aug. 1955, 13 p. (TS800 Un3.3r Contin.)

Data show that the modulus of rupture of 5-ply, 5/16-in. Sitka spruce plywood was not affected adversely.

7805 Compression, Tension, and Shear Tests on Yellow-Poplar Plywood Panels of Sizes That Do Not Buckle With Tests Made at Various Angles to the Face Grain. C. B. Norris and P. F. McKinnon. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1328, Feb. 1956, 50 p. (TS800 Un3.3r Contin.)

Tests agree reasonably well with theory.

7806 Influence of Manufacturing Variables on the Impact Resistance of Resin-Treated Wood. M. A. Millett, R. M. Seborg, and A. J. Stamm. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1386, Mar. 1956, 19 p. (TS800 Un3.3r Contin.)

Specific gravity has the greatest effect on notched toughness of the product.

7807 The Elastic Properties of Wood. Young's Moduli and Poisson's Ratios of Douglas-Fir and Their Relations to Moisture Content. R. S. McBurney and J. T. Drow. *U. S. Department of Agriculture, Forest Products Laboratory, Report No.* 1528-D, Mar. 1956, 17 p. (TS800 Un3.3r Contin.)

Both Young's moduli and Poisson's ratios were variable in these tests.

See also: **6449** (silkworn nutrition); **6547** (ClO_2 generation); **6551** (production of ClO_2); **6630** (chromatography of dyes); **6633** (analysis of pulp black liquor); **6634** (analysis of paper pulp); **6717** (pyrene dyes); **7209** (paper gloss measurements); **7289** (buckling of plywood); **7516** (γ-ray testing of wood); **7731** (treatment of papermill wastes); **7752** (papermill roof condensation); **7862** (forest resources).

WELDING AND JOINING

7808* (Russian.) Preventing Pores in Submerged Arc Welding and Deposition. **Preduprezhdenie por pri svarke i naplavke pod fliusom.** I. I. Frumin. *Avtomaticheskaia Svarka*, v. 9, Nov.-Dec. 1956, p. 1-30.

Experimental data on the formation of pores; role of H as the chief cause of pores; role of N, carbon oxides, and water vapor; means of preventing pores.

7809* (Russian.) The Resistance of the Weld Zone of Medium Alloy Steels to the Formation of Cracks During Welding With AC and DC. **O stoikosti okoloshovnoi zony srednelegirovannykh stalei protiv obrazovaniia treshchin pri svarke na postoiannom i peremennom toke.** A. M. Makara and T. M. Slutskaia. *Avtomaticheskaia Svarka*, v. 9, Nov.-Dec. 1956, p. 31-37.

Shows that d.c. welding results in greater resistance to crack formation than does a.c. welding due to the lower H content in the weld bath.

7810* (Russian.) The Effects of the Chemical Composition of Iron-Chrome-Carbon Alloys on Weld Hot Cracking. **O vlianii khimicheskogo sostava zhelezokhromouglerodistykh splavov na sklonnost' k obrazovaniu kristallizatsionnykh treshchin.** I. K. Pokhodnia. *Avtomaticheskaia Svarka*, v. 9, Nov.-Dec. 1956, p. 55-63.

Study of the tendency toward hot cracking in alloys containing from 0.1 to 2.5% C and from 3 to 15% Cr.

7811 High-Nickel Electrode Welds Most Dissimilar Metals. *Iron Age*, v. 179, Feb. 14, 1957, p. 122-123.

Method reduces costs because only one electrode type is needed, with no special equipment or techniques, and pre-weld and post-weld heat treatment can at times be avoided.

7812 Weld Quality Rides With Steel Selection. A. C. Ward. *Iron Age*, v. 179, Feb. 21, 1957, p. 104-106.

Some weld-affecting factors to be considered in selecting materials.

7813 Dip Brazing With Paste Filler. Donald E. Wernz and Mel M. Schwartz. *Materials & Methods*, v. 45, Feb. 1957, p. 118-120.

A new Al filler is replacing conventional sheet and wire brazing preforms.

7814 Here's a New Welding Process. *Steel*, v. 140, Mar. 4, 1957, p. 126-128.

Semiautomatic Unionarc process combines a continuously fed wire, CO_2, a magnetic flux, and d.c. to produce a sound, clean-looking weld in mild steel.

7815* (Russian.) Investigation of Automatic Electric Arc L62 and LS 59-1 Brass Beadings on Gray Cast Iron. **Issledovanie avtomaticheskoi elektrodugovoi naplavki latunei L62 and LS 59-1 na seryi chugun.** F. F. Benua and V. Iu. Ozolin. *Svarochnoe Proizvodstvo*, no. 1, Jan. 1957, p. 4-8.

Brazing of steel to cast iron.

7816* (Russian.) The Problem of Selecting Welding and Depositing Conditions for Carbon Steel. **K voprosu o metodike vybora rezhima svarki i naplavki uglerodistykh stalei.** A. N. Babaev and G. A. Bel'chuk. *Svarochnoe Proizvodstvo*, no. 1, Jan. 1957,p.8-12.

Calculation of the austenite decomposition temperature, based on the curves of isothermal decomposition.

7817* (Russian.) Properties of Welded Joints Made in an Atmosphere of Argon and Carbon Dioxide. **Svoistva svarnykh soedinenii vypolnennykh v argone i uglekislom gaze.** E. M. Eskin, E. P. Rogozhkin, and N. M. Novozhilov. *Svarochnoe Proizvodstvo*, no. 1, Jan. 1957, p. 15-17.

7818* Try Carbide Bonding With a No-Mix Epoxy. Bernard Gould. *Tooling and Production*, v. 22, Feb. 1957, p. 79-83.

New non-flowing, low-heat adhesive eliminates distortion and embrittlement in the critical joining of dissimilar materials, and offers possible cost savings of up to 90%.

7819* (German.) Welding Conference of 1956 in Hannover. Proceedings. **Grosse Schweisstechnische Tagung 1956, Hannover. Vorträge.** 68 p. 1956. Deutscher Verlag für Schweisstechnik, (DVS) GMBH, Düsseldorf. (TS227 D48g Over.)

Methods and equipment for various types of welding are discussed in 7 papers presented at the meeting.

7820 Study of Interrupted Welding of Heavy-Wall Steam Pipe. I. A. Rohrig, J. O. Smith, and E. G. Shifrin. *Welding Journal*, v. 36, Feb. 1957, p. 128-131.

Alloy-steel pipe (2¼% Cr-1% Mo) in all wall thicknesses up to ¾ in. can be welded safely with interrupted heat cycles.

7821 Hydrogen vs. Acetylene vs. Inert Gas in Welding Aluminum Alloys. J. Koziarski. *Welding Journal*, v. 36, Feb. 1957, p. 141-148.

Compares type, amount, and location of porosity and fusion obtained with these methods of welding.

7822 Welding of High-Strength Pressure Vessel Steels in Heavy Sections. A. P. Bunk. *Welding Journal*, v. 36, Feb. 1957, p. 62s-66s.

Welding procedure tests are developed for 4-in. thick plates in accordance with ASME code requirements.

7823 Weldability of Three Ferritic Chromium-Molybdenum Bearing Steels. B. Trehearne. *Welding and Metal Fabrication*, v. 25, Feb. 1957, p. 48-52.

Laboratory tests led to development of practical welding procedures for two steels.

7824 Aspects of the New Monel and Nickel Arc-Welding Electrodes. F. A. Ball and D. R. Thorneycroft. *Welding and Metal Fabrication*, v. 25, Feb. 1957, p. 59-64.

Welding clad steels, overlays on mild steel, and solid Ni on Monel; hot cracking tests, hardness of weld metal; analysis and microstructure of the various deposits.

7825 Development of Metal-Bonding Adhesive With Improved Heat Resistance. J. M. Black and R. F. Blomquist. *Wright Air Development Center Materials Laboratory, WADC Technical Report* 56-650, Nov. 1956, 14 p. (TL507 Un3.18w Vis.)

Glass cloth with a heat-cleaned or Volan A finish was the best supporting medium for adhesive FPL-878 in a tape form.

See also: **7273** (bolted joints); **7292** (weed joint design); **7293** (welded open-web beams); **7391** (strength of riveted joints); **7430** (hot cracking in stainless steel); **7463** (weld-joint strength).

MISCELLANEOUS

7826* A Method for Deriving Numerical Differentiation Formulas. R. T. Gregory. *American Mathematical Monthly*, v. 64, Feb. 1957, p. 79-82.

A new approach to the problem of polynomial interpolation.

7827* Ozone Toxicity and Substances Associated With Its Production. Joseph L. Svirbely and Bernard E. Saltzman. *Archives of Industrial Health*, v. 15, Feb. 1957, p. 111-118.

Data obtained from acute inhalation studies indicate that ozone per se is a highly toxic substance to rats, mice, and hamsters. Injurious effects appear to be lessened by a previous brief exposure to relatively low concentrations.

7828 A Practical Application of Uncertainty Calculations to Measured Data. L. W. Thrasher and R. C. Binder. *ASME, Transactions*, v. 79, Feb. 1957, p. 373-376.

It is proposed that the single-sample tester estimate his error and give odds that the error would be less than the uncertainty interval if the measurement were repeated a large number of times.

7829* Analysis of Tangential Properties of Curves of Infinite Length. A. S. Besicovitch. *Cambridge Philosophical Society, Proceedings*, v. 53, Jan. 1957, p. 69-72.

7830* Limiting Properties of Mathieu Functions. M. A. Jaswon. *Cambridge Philosophical Society, Proceedings*, v. 53, Jan. 1957, p. 111-114.

A new analysis of the coefficients appearing in periodic Mathieu functions.

7831* The Numerical Solution of Linear Differential Equations in Chebyshev Series. C. W. Clenshaw. *Cambridge Philosophical Society, Proceedings*, v. 53, Jan. 1957, p. 134-149.

An expansion in Chebyshev polynomials is assumed for the highest derivative occurring in the equation; the coefficients are then determined by integrating this series, substituting in the original equation and equating coefficients.

7832* Eigenvalue Problems Treated by Finite-Difference Methods. II. Two-Dimensional Schrödinger Equations. H. C. Bolton and H. I. Scoins. *Cambridge Philosophical Society, Proceedings*, v. 53, Jan. 1957, p. 150-161.

7833* A Catalogue of the Principal Research Projects Conducted, Financed Partially or Wholly, or Participated in by the Container, Engineering, Mechanical and Sanitation Research Departments of the Association of American Railroads. Sections individually paged. 1956. AAR Research Center, Chicago. (TF173 As78c)

7834 Today's Frontiers in High Temperature Technology. N. K. Hiester, F. A. Ferguson, and N. Fishman. *Chemical Engineering*, v. 64, Mar. 1957, p. 237-252.

The current state of technology in high temperature methods, materials, and processes.

7835 Hydrogen. U. S. Atomic Energy Commission, Safety and Fire Protection Technical Bulletin No. 5. 10 p. 1956. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (QD181.H1 Un3.2h)

Explosion is the main hazard of H. In air, gaseous H forms an explosive mixture in the range of 4.1 to 74.2% by volume. The liquid is hazardous because, due to evaporation, the gas is always present. Some safety rules are listed.

7836* A Physical Approach to Stochastic Processes. Alladi Ramakrishnan. *Indian Academy of Sciences, Proceedings*, v. 44, sec. A, Dec. 1956, p. 428-444.

A general phenomenological description; a process defined by the forward differential equation; recurrence and first passage times; remarks on Markovian, non-Markovian, and quasi-Markovian processes.

7837* Industrial Research, 1956-1957. Percy Dunsheath, editor. 3rd Ed. 444 p. 1957. Todd Publishing Group Ltd., London. (T176 I2)

A directory of British research organizations, their personnel, and activities.

7838 How to Protect Your Ideas. John S. Lieb. *Iron and Steel Engineer*, v. 34, Feb. 1957, p. 148-158.

The best way to protect ideas of company inventors is to utilize the patent laws. It is also desirable to have close cooperation among the patent, engineering, production, and advertising departments.

7839 A Criterion for Homogeneous Linear Differential Equations With Damped Solutions. Aurel Wintner. *Journal of Mathematics and Mechanics*, v. 6, Jan. 1957, p. 109-117.

7840 The Liberian Year Book, 1956. Henry B. Cole, editor. 312 p. 1956. Diplomatic Press and Publishing Co., London. (HC591.L6 L61)

A compilation of miscellaneous information about Liberia, its people, culture, government, industry, and economy.

7841* Some Effects of Modern Materials Handling Methods on Stores Administration. L. J. Hoefkens. *Mechanical Handling*, v. 44, Feb. 1957, p. 88-94.

7842* Approximation of Curves by Circular Arcs. W. H. Sheppard. *Mechanical World and Engineering Record*, v. 137, Feb. 1957, p. 60-64.

Improved methods to facilitate drawing and to reduce manufacturing costs to a minimum.

7843 The National Research Council Review, 1956. N.R.C. No. 3976, 284 p. 1956. National Research Council of Canada, Ottawa. (T4 N21r Vis.)

Includes reports on recent and current research in biology, chemistry, physics, building, mechanical engineering, and radio and electrical engineering.

7844 National Science Foundation, 6th Annual Report 1956. 189 p. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (Pamphlet)

Recent developments; foundation activities and program.

7845 (Dutch.) 1955 Annual Report Concerning the Activities of the Central Organization (T.N.O.) and the Special Organizations (T.N.O.) for Applied Scientific Research in the Netherlands on Behalf of Industry, Commerce and Transport, Food, Agriculture, Defense, and Health. **Jaarverslag 1955 betreffende de centrale organisatie T.N.O. en de bijzondere organisaties T.N.O. ten behoeve van nijverheid, handel en verkeer, voeding, landbouw, rijksverdediging, volkgezondheid.** 350 p. 1956, T.N.O., The Hague, Netherlands. (Pamphlet)

A general survey of the financial and administrative situation during 1955 of the Dutch Central and special organizations, and their various activities in many fields of applied scientific research.

7846 Off-Site Radiological Defense Training Exercise. Charles T. Rainey. *Operation Teapot (U. S. Atomic Energy Commission)*, WT-1183, Dec. 1956, 15 p. (UF767 Un3.1wt Contin.)

Report on an exercise designed to provide realistic experience for personnel with state and local responsibilities in radiological defence, and to field test equipment, plans, and procedures.

7847 Progress in Research. *Pennsylvania State University, Mineral Industries Experiment Station Circular No.* 48, 71 p. (TN21 P38c Contin.)

A summary of the University's 1955-1957 research program in the earth sciences, mineral engineering, and mineral technology.

7848 Proceedings 1956, Ninth Northwest Conference on Road Building. 118 p. University of Washington. (TE5 N81p Vis.)

Fourteen papers dealing with highway problems, including needs, manpower shortages, and roadbuilding costs.

7849* The Application of Dimensional Analysis to Learning Theory. Aviva Menkes and Josh Menkes. *Psychological Review*, v. 64, Jan. 1957, p. 8-13.

Application as a method of combining variables into functional relationships by anlytical considerations, as a way of discovering new variables, and as a tool for scaling.

7850 Railroad Car Facts. Statistics on Car Building and Car Repairing, 1955. 114 p. 1956. American Railway Car Institute, New York. (TF600 Am35r Over.)

7851 Stretching the Executive Hours. Luis J. A. Villalon. *Research & Engineering*, v. 3, Feb. 1957, p. 12-14.

Some psychological tricks for increasing executive productivity.

7852* Design of Research Laboratories. Richard Llewelyn Davies. *Royal Institute of Chemistry, Journal*, v. 81, Jan. 1957, p. 5-15.

Results of a laboratory study program dealing with space, services, and lighting needs.

7853 (Norwegian.) Royal Norwegian Council for Scientific and Industrial Research. Ten-Year Report, 1946-1956. **Norges Teknisk-Naturvitenskapelige Forskningsråd. Ti-Års Beretning. Asbjørn Barlaup.** 142 p. 1956. Royal Norwegian Council for Scientific and Industrial Research, Oslo. (Q180.N8 N76t)

Review of work of the council during the period 1946-1956, including work for the recruitment of scientific personnel, support of research at universities through grants, foundation of new research institutes, stimulation of research projects of national interest, and the giving of advice on scientific matters.

7854* Difference Methods in the Theory of Local Order Bases and Their Equivalent Normalized Function Bases. S. Beatty. *Royal Society of Canada, Transactions*, v. 50, ser. 3, sec. 3, June 1956, p. 1-11.

7855* Some Properties of Approximate Inverses of Matrices. N. S. Mendelsohn. *Royal Society of Canada, Transactions*, v. 50, ser. 3, sec. 3, June 1956, p. 53-59.

7856 Strontium-90 in Man. Laurence Kulp, Walter R. Eckelmann, and Arthur R. Schulert. *Science*, v. 125, Feb. 8, 1957, p. 219-225.

The world-wide average Sr^{90} content of man was about 0.12 $\mu\mu$c. per g. of Ca in 1955, or 1/10,000 of the maximum permissible concentration. This level should rise to 1 to 2 $\mu\mu$c. per g. of Ca by 1970.

7857 Science and Economic Development: New Patterns of Living. Richard L. Meier. 266 p. 1956. John Wiley & Sons, New York. (HC54 M47s)

Present status and future trends in world population, nutrition, energy resources, and living standards.

7858 A Scientific Sampler. Raymond Stevens, Howard F. Hamacher, and Alan A. Smith, editors. 413 p. 1956. D. Van Nostrand Co., New York. (Q171 L72s)

A collection of short reviews previously presented in the *Bulletin*, published by Arthur D. Little, Inc., during the period 1925-1955. The papers cover a wide variety of subjects, including physiology, sociology, nutrition, medicine, research techniques, engineering, and nuclear physics.

7859 Structure of Rings. Nathan Jacobson. v. XXXVII. 263 p. 1956. American Mathematical Society, Providence. (QA247 J15s)

Mathematical structure theory of rings without finiteness assumptions.

7860 Tables of Weber Parabolic Cylinder Functions. J. C. P. Miller, editor. 233 p. 1955. Her Majesty's Stationery Office, London. (QA408 G79.5n Over.)

7861* The Times Atlas of the World. Mid-Century Edition. v. III. Northern Europe. v. IV. Southern Europe and Africa. Sections not paged. 1956. The Times Publishing Co., London. (G1019 T48a Over.)

Large-scale detailed maps and gazetteer with complete indexes.

7862 A World Geography of Forest Resources. Stephen Haden-Guest, John K. Wright, and Eileen M. Teclaff, editors. 736 p. 1956. Ronald Press Co., New York. (SD121 H11w)

A world-wide appraisal of forest resources in terms of their natural functions and those that man has imposed on them. The forest situation and problems of 25 particular regions.

7863* A Review of the Air Force Materials Research and Development Program. Mary M. Sokas. *Wright Air Development Center, WADC Technical Report* 53-373, Suppl. 2, Feb. 1956, 130 p. (TA410 Un3.18w)

Abstracts of 205 technical reports dealing with adhesives, metallurgy, analysis and measurement, biochemistry, textiles, petroleum products, plastics, packaging, protective treatments, and rubber.

See also: **6534** (the scientific approach); **7415** (fatigue of Al alloy riveted joints).